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ABSTRACT

The Industrialist's Manual No. 1, Shear Power Company is part of a set of 21 manuals (AA 001 009-001 029) used in APEX (Air Pollution Exercise), a computerized college and professional level "real world" game simulation of a community with urban and rural problems, industrial activities, and air pollution difficulties. The first two sections, which are the same in each of the student manuals (volumes 1 to 19), contain general information about the APEX interaction simulation and a glossary of reference terms. The remaining sections contain the following: industrialist's role description; annotated industrialist's worksheet; a sample industrialist's worksheet; background information for industrialist's role; an annotated printout for cycle one; and a map of the 29 APEX analysis areas. The manual is identical to the other industrialist's manuals, except for the last two sections. The game simulation procedure and required computer facilities are further described in resumes for AA 001 009 and 001 010. (PR)

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Environmental Protection Agency

VOLUME 6

INDUSTRIAL

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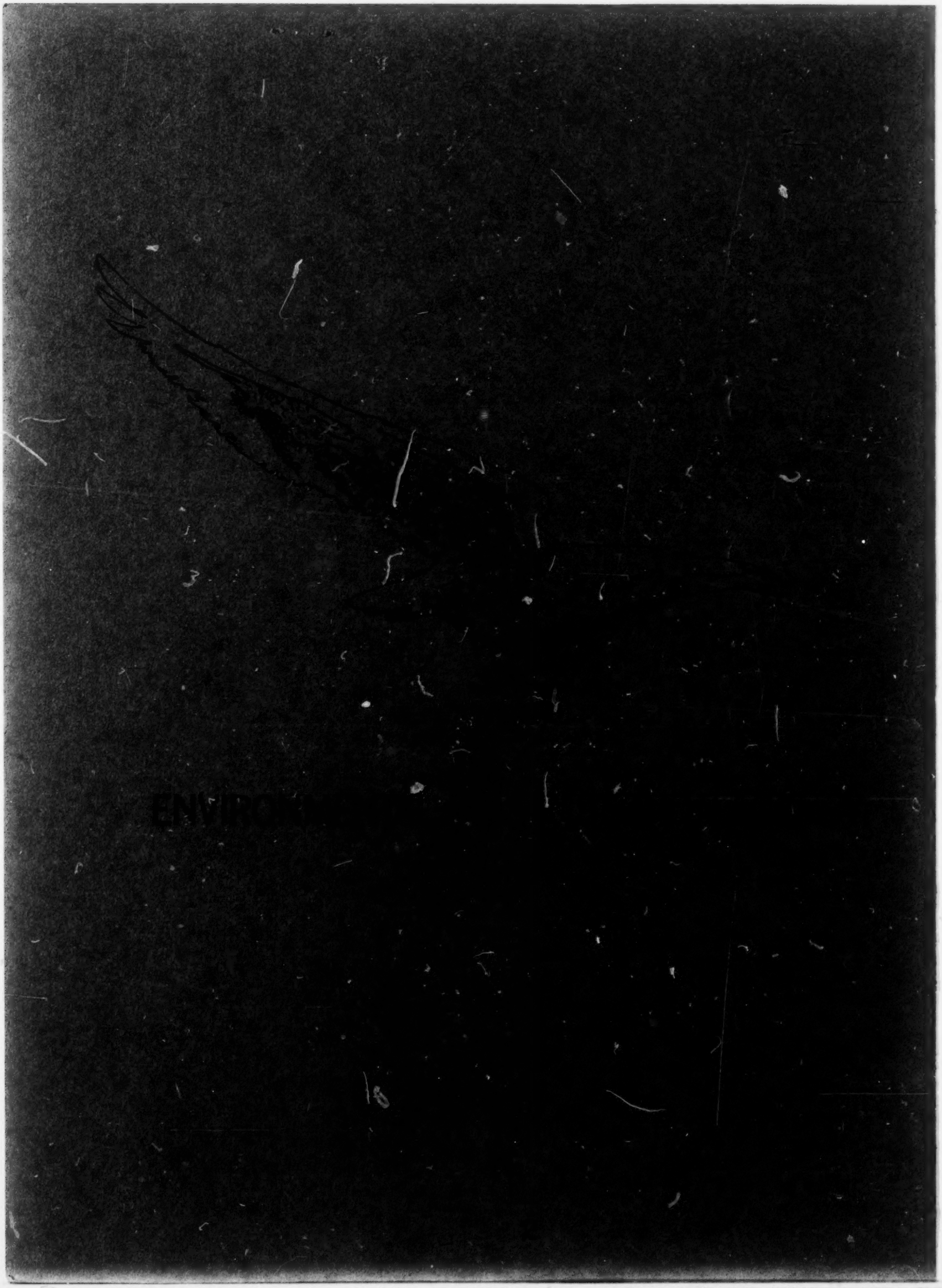

APEX VOLUME 6
INDUSTRIALIST'S MANUAL
No. 1 SHEAR POWER COMPANY

This course is designed for professional persons in the field of air pollution control. The course manual has been prepared specifically for the trainees attending the course, and should not be included in the reading lists of periodicals as generally available.

CONDUCTED BY

The Office of Manpower Development's
Institute for Air Pollution Training

ENVIRONMENTAL PROTECTION AGENCY
Office of Air Programs
Office of Manpower Development
Institute for Air Pollution Training
Research Triangle Park
North Carolina 27711

APEX•VOLUME 6
INDUSTRIALIST No.1
Shear Power Company

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LIST OF MANUALS USED IN THE APEX GAME SIMULATION

Volume 1: Game Director's Manual

Volume 2: Computer Operator's Manual

Volume 3: Air Pollution Control Officer's Manual

Volume 4: City Politician's Manual

Volume 5: County Politician's Manual

Volume 6: Industrialist's Manual: No. 1, Shear Power Company

Volume 7: Industrialist's Manual: No. 2, People's Pulp Plant

Volume 8: Industrialist's Manual: No. 3, Rusty's Iron Foundry

Volume 9: Industrialist's Manual: No. 5, Caesar's Rendering Plant

Volume 10: Industrialist's Manual: No. 6, Dusty Rhodes Cement Co.

Volume 11: Developer's Manual: No. 1

Volume 12: Developer's Manual: No. 2

Volume 13: Developer's Manual: No. 3

Volume 14: Developer's Manual: No. 4

Volume 15: Developer's Manual: No. 5

Volume 16: Developer's Manual: No. 6

Volume 17: Developer's Manual: No. 7

Volume 18: City Planner's Manual

Volume 19: County Planner's Manual

Volume 20: Reference Materials

Volume 21: Legal References: Air Pollution Control Legislation

Section 1-1

Introduction to - APEX

APEX is one of, if not the most complex gaming-simulations of an urban area in use today. Although it was designed to supplement standard teaching methods, APEX is far more than an educational tool. It is a communication channel of a new kind -- capable of providing both the language and the forum for information transfer between persons and groups with different educational and cultural backgrounds as well as different prespectives on urban life.

APEX is composed of two essential components (1) a computerized system made up of a series of well-integrated simulation models (2) linked to a "gamed" environment encompassing a series of interactive roles. The computerized system predicts the changes that occur in several sectors of urban life in response to the decisions made by participants in the "gamed" environment, decisions made by persons outside the "gamed" environment (other actors whose behavior is simulated in the computer), and external pressures on the city (also simulated in the computer).

The county of APEX is run year by year by a set of elite decision makers performing both the mundane and extraordinary functions of their office in the "gamed" environment. Each cycle or year is condensed in time to a three to eight hour session during which the decision makers formulate their yearly policy. The decisions that emerge out of the "competitive-cooperative" environment of the gaming-simulation are used as priming inputs to the computer simulation. The change in the status of the urban area is calculated by the computer and returned to the decision makers as the primary input to the next cycle of action. Included in the change picture generated by the computer are selected social indicators measuring the magnitudes of change in assorted key areas and a newspaper serving as the focal point of local public opinion.

The key decision makers acting in the gamed environment include politicians and planners from a central city and a county, an air pollution control officer from the county, and land developers and industrialists from the private sector. The politicians are responsible for the administration of their respective jurisdictions and for the formulation and implementation of various programs to upgrade the social status of their constituents. The planners serve as aides to the politicians and represent the major long range coordinating force in the community. The air pollution control officer is charged with the task of cleaning and monitoring the air mass above APEX county. The land developers and industrialists have the responsibility of running their particular business concerns within the confines of the county. It is expected that each decision maker will find it to his advantage to coordinate and/or compete with other players in his efforts to promote his strategies. The APEX General Interaction Diagram included here (see page) indicates possible linkages among players and between players and the simulation.

In general, people have great difficulty understanding the dynamics of a complex system through traditional means. Gaming-simulation offers participants the opportunity to study, work with, and discuss the struc-

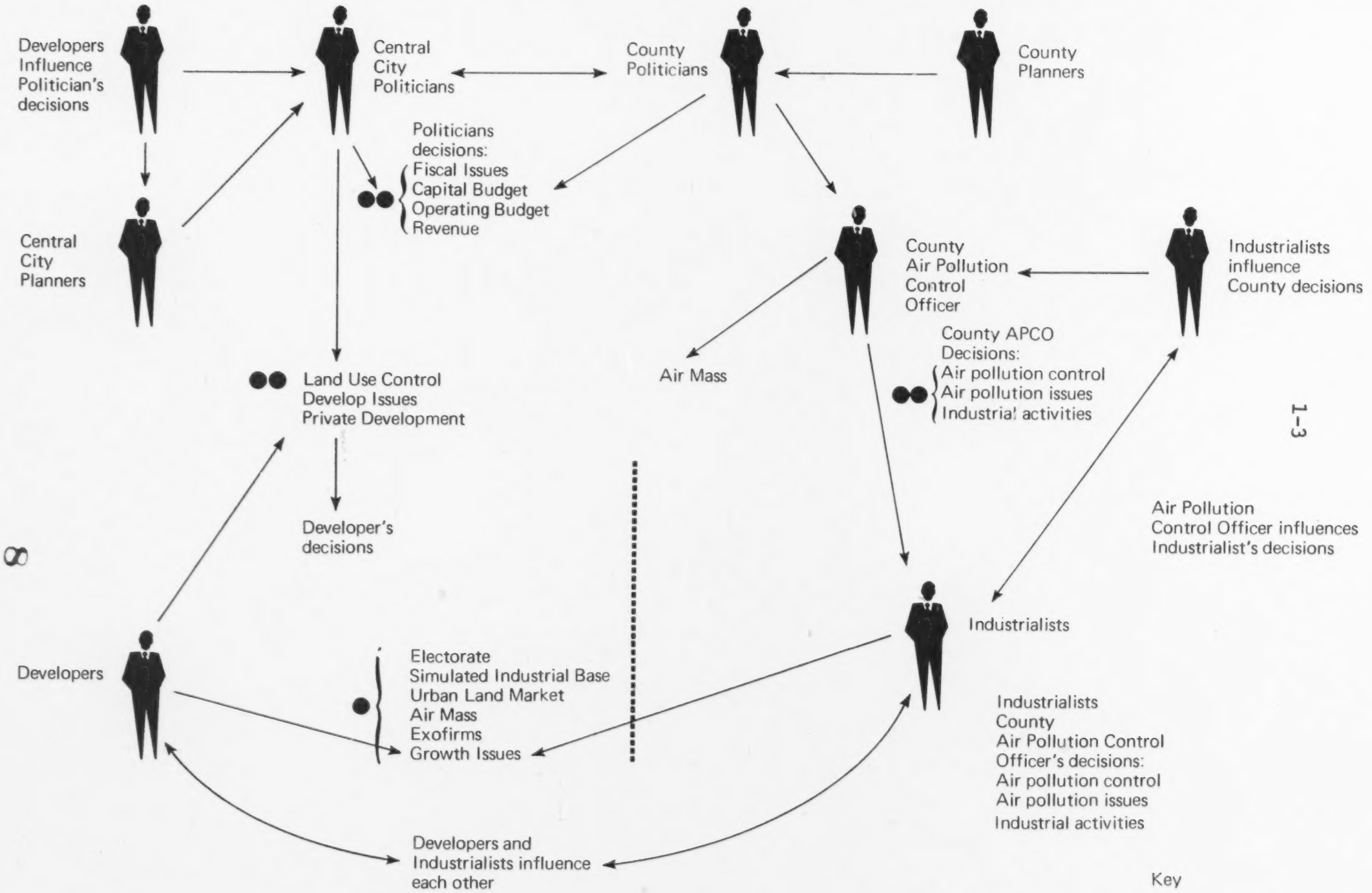
ture of such a system and to experiment with intervention strategies designed to change that structure. When used as a teaching device, the strength of a gaming-simulation such as APEX lies in the opportunity afforded participants for involvemnt in the system. When compared with the passive observation of the system offered by traditional methods, this approach has had great success.

In theory, complex gaming-simulation of the APEX variety is more than a training device or communications facilitator. If the models were more sophisticated the data base more accurate and more complete, a complex gaming-simulation would be a policy testing device for use by practicing urban politicians, planners, APCO's and administrators. Conditional predictions (predictions based on the particular policies and/or decisions submitted to the model) of the ramifications of various decisions can be generated through the use of a complex gaming-simulation -- predictions that may forewarn the model user of unforeseen reactions to policy at several levels of the urban hierarchy ranging from that of the highest level.

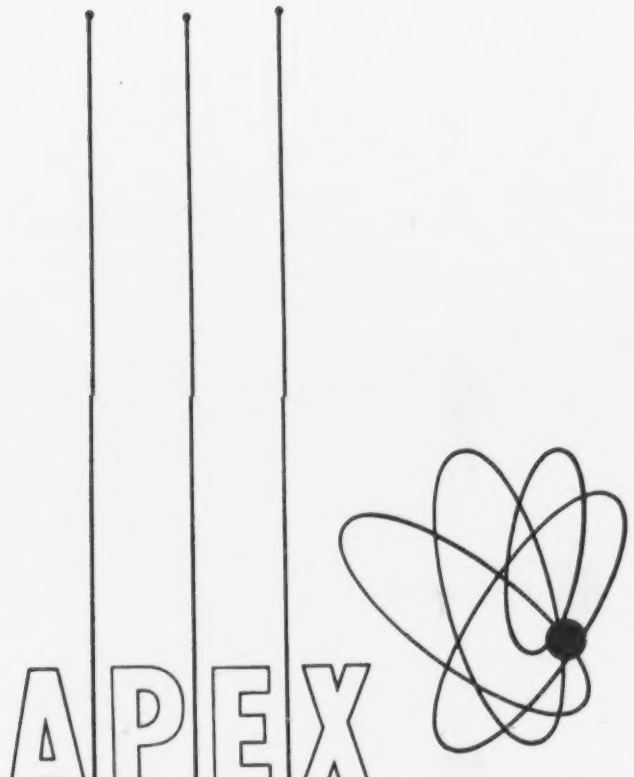
The gamed environment is similar to that found in a typical midwestern industrialized town. (In fact, the prototype city is Lansing, Michigan). It has a population approaching 220,000 including several of minority groups sharing racial or ethnic ties. There is a relatively dense central city in the heart of the county, an adjacent suburb and two outlying townships. Most of the industry is located in the central city (as are the minority groups). Major firms include a large auto plant and the state government offices. The suburb houses a major university. The townships are largely agricultural, although urbanizing settlements are dotting the landscapes. There is a major river running through the city serving as the primary drainage system for the county. The climate of APEX is temperate, with summer temperatures averaging about 70 degrees and winter temperatures averaging near 25 degrees. Prevailing winds are westerly, swinging to the southwest in summer and northwest in winter.

For the purposes of the gaming exercise, APEX county is divided into 29 analysis areas (see the attached map, Section 9). Population, employment and land use will be allocated to the areas and are categorized by types established especially for APEX. These types are described in the glossary included in this manual (Section 2) a glossary designed to aid participants in learning the terminology of urban and environmental management as well as that of the gaming exercise.

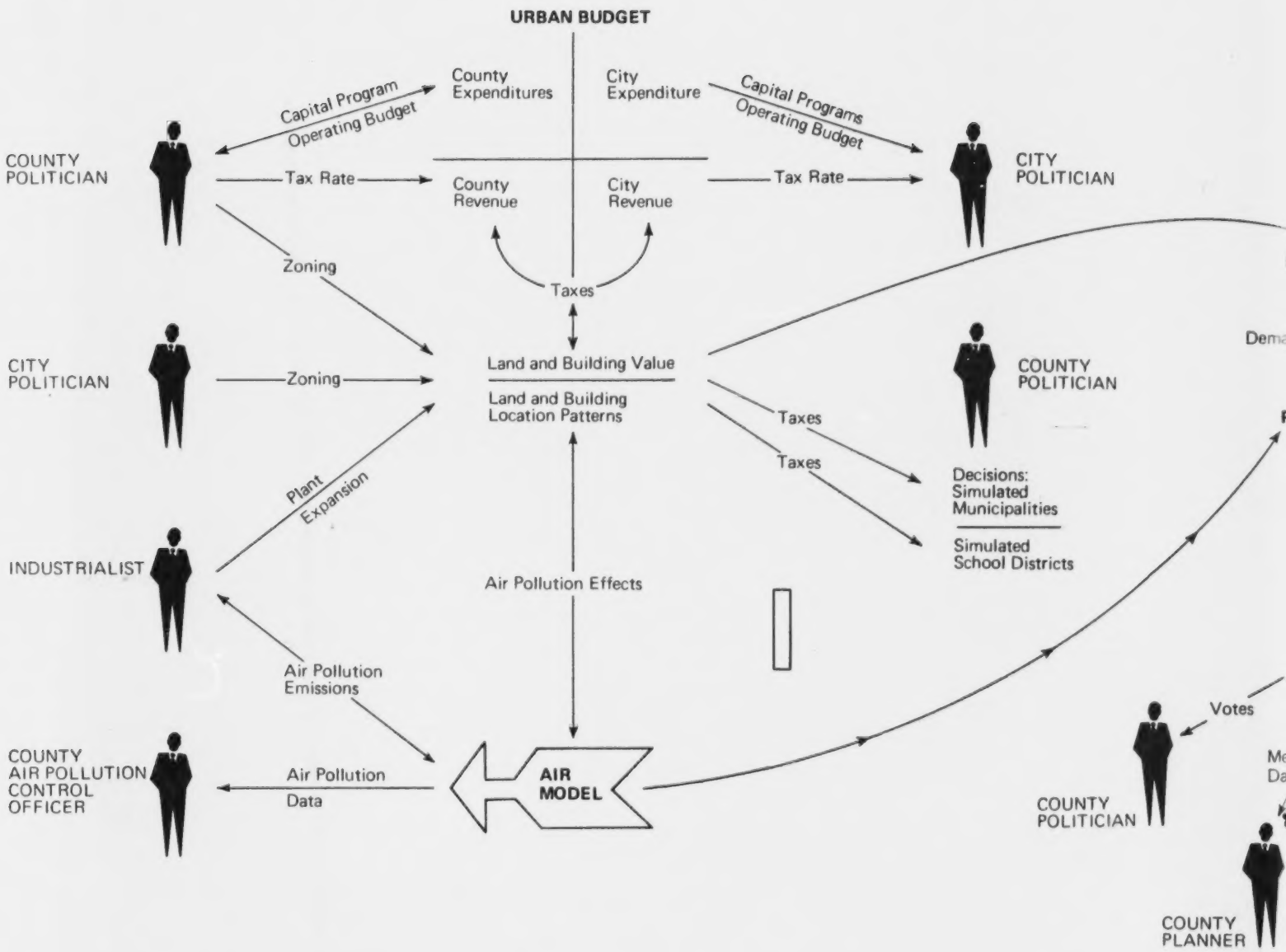
FOR ADDITIONAL INFORMATION:
Address inquiries to Chief, Institute for Air Pollution Training
Environmental Protection Agency
Research Triangle Park, North Carolina 27711



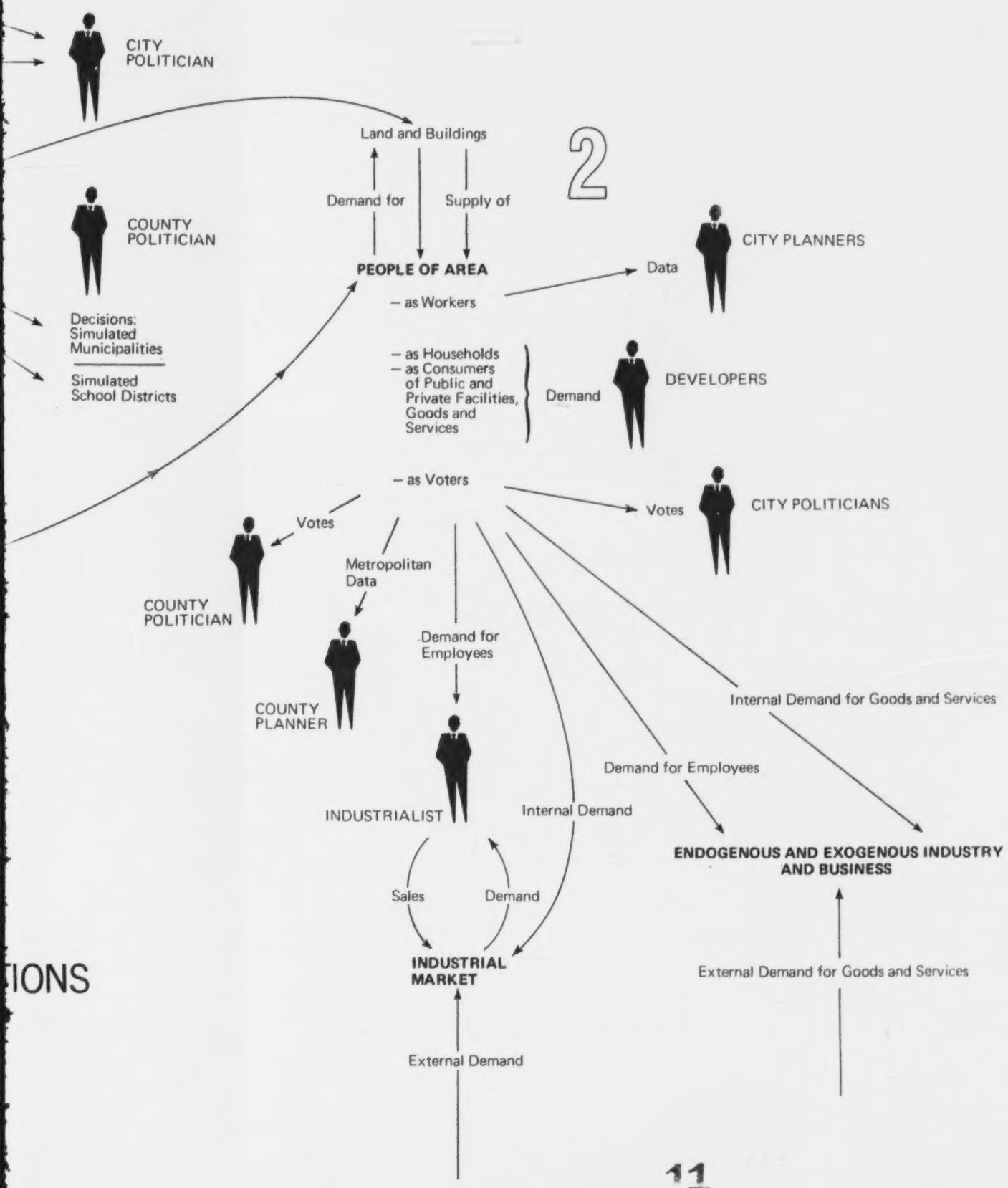
APEX GENERAL INTERACTION DIAGRAM



FUNCTIONAL INTERACTIONS
● SIMULATIONS



APEX FUNCTIONAL INTERACTIONS ● SIMULATIONS


CITY POLITICIAN
Land and Buildings
2
COUNTY POLITICIAN
Demand for
Supply of
CITY PLANNERS
PEOPLE OF AREA
Data
– as Workers
Decisions: Simulated Municipalities
Simulated School Districts
– as Households
– as Consumers of Public and Private Facilities, Goods and Services
Demand
DEVELOPERS
– as Voters
Votes
Votes
CITY POLITICIANS
Metropolitan Data
COUNTY POLITICIAN
Demand for Employees
Internal Demand for Goods and Services
COUNTY PLANNER
Demand for Employees
INDUSTRIALIST
Internal Demand
ENDOGENOUS AND EXOGENOUS INDUSTRY AND BUSINESS
Sales
Demand
INDUSTRIAL MARKET
External Demand for Goods and Services
External Demand

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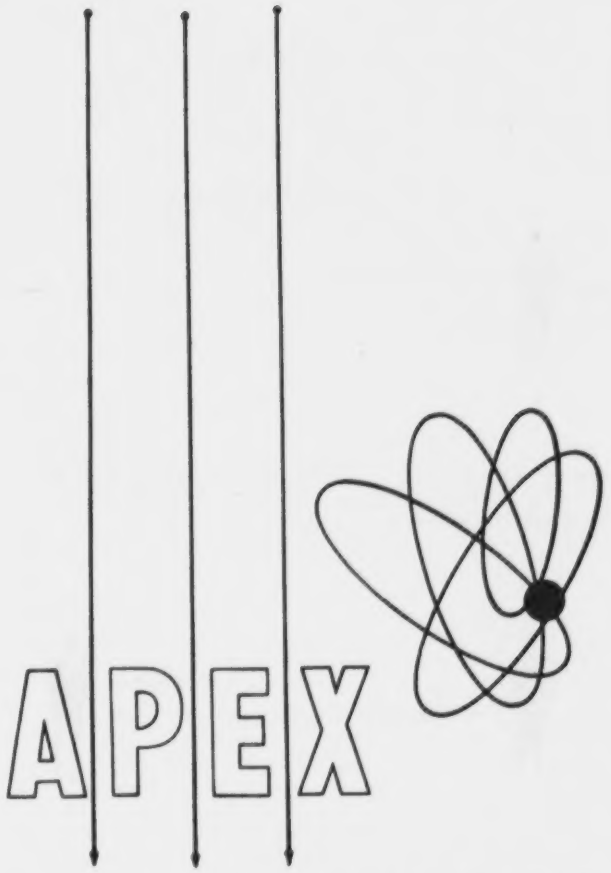
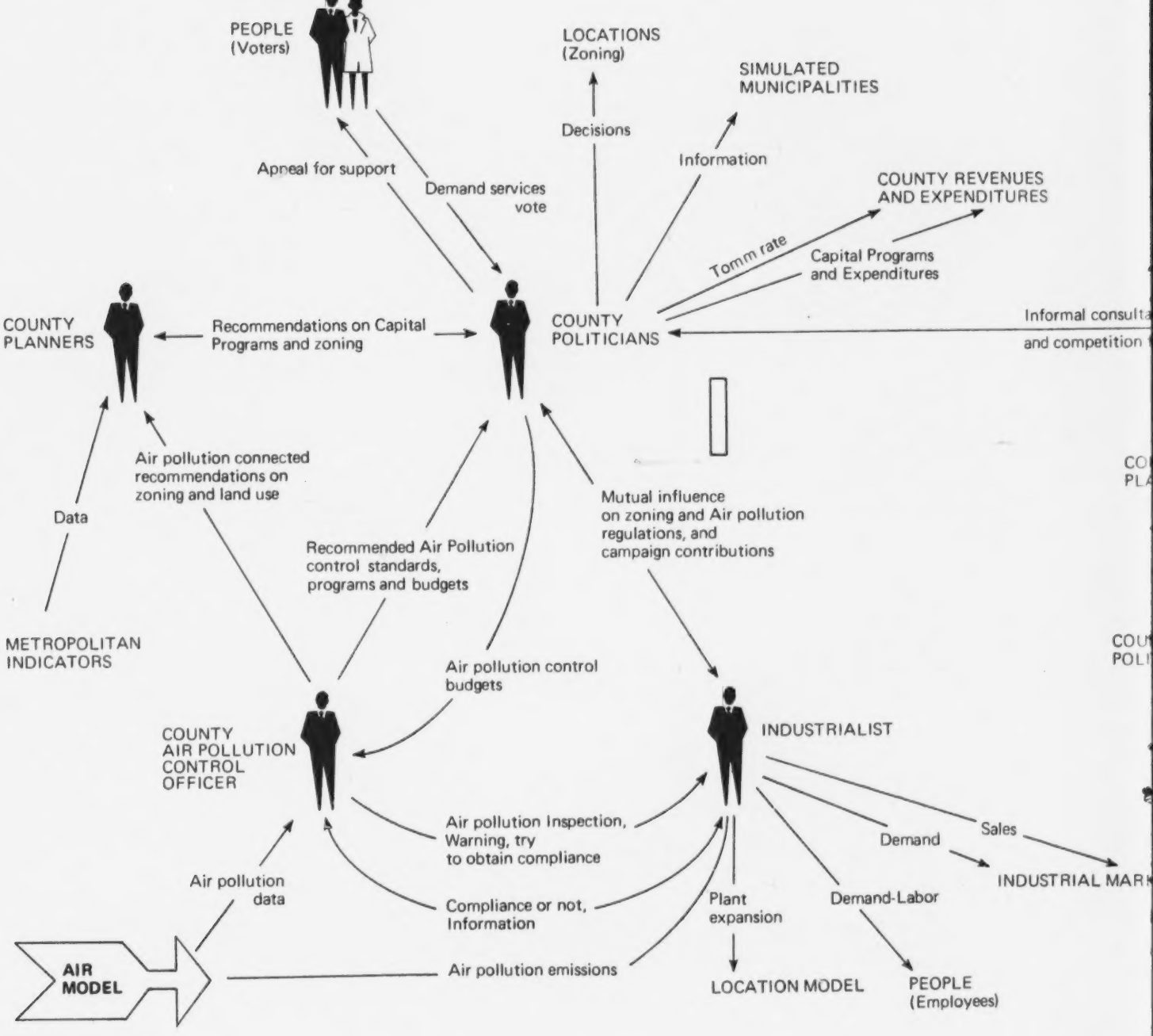
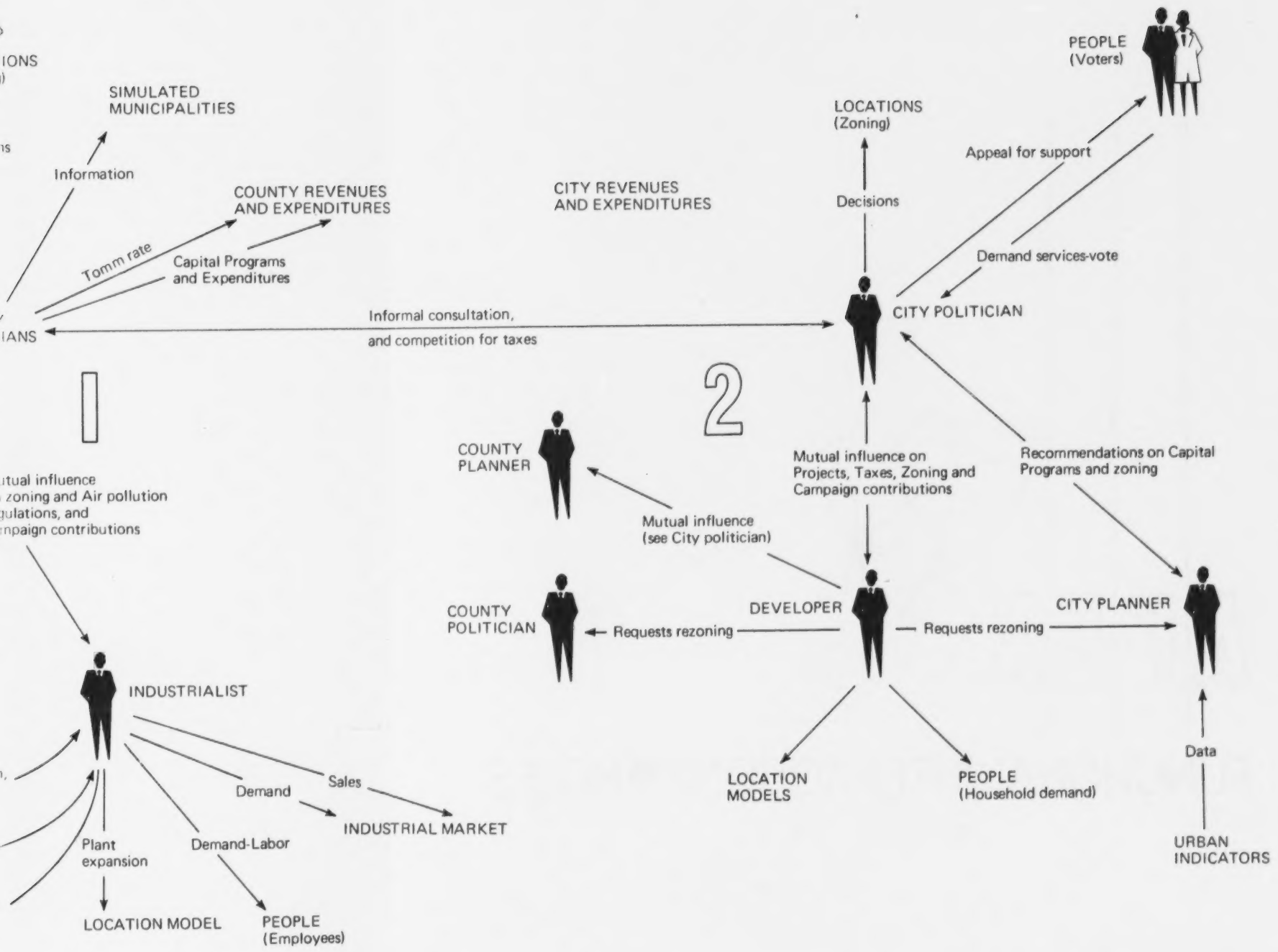


FUNCTIONAL INTERACTIONS ● ROLES


PEOPLE
(Voters)
LOCATIONS
(Zoning)
SIMULATED
MUNICIPALITIES
Decisions
Information
Appeal for support
Demand services
vote
COUNTY REVENUES
AND EXPENDITURES
Tomm rate
Capital Programs
and Expenditures
COUNTY
PLANNERS
Recommendations on Capital
Programs and zoning
COUNTY
POLITICIANS
Informal consulta
and competition
Air pollution connected
recommendations on
zoning and land use
Data
Mutual influence
on zoning and Air pollution
regulations, and
campaign contributions
Recommended Air Pollution
control standards,
programs and budgets
METROPOLITAN
INDICATORS
Air pollution control
budgets
COUNTY
AIR POLLUTION
CONTROL
OFFICER
INDUSTRIALIST
Air pollution Inspection,
Warning, try
to obtain compliance
Sales
Demand
INDUSTRIAL MARK
Air pollution
data
Compliance or not,
Information
Plant
expansion
Demand-Labor
AIR
MODEL
Air pollution emissions
LOCATION MODEL
PEOPLE
(Employees)



APEX FUNCTIONAL INTERACTIONS ● ROLES

Section 2-1

GLOSSARY AND REFERENCE TERMS

ABATEMENT

Abatement is the reduction of pollutant emissions from a source or sources.

AIR POLLUTION

Air pollution is the presence in the outdoor air of substances which, when present in sufficient quantity or over a period of time, can cause an undesirable effect upon man, property, or the environment.

AIR POLLUTION REGULATIONS

Air pollution regulations are legal constraints on pollutant emissions, production processes, or control systems. State regulations and County regulations are enforceable by legal sanctions, while recommendations are not.

AIR QUALITY

Air quality refers to the pollution concentration characteristics of the atmosphere or ambient air in a given area. It is usually stated in terms of the levels of concentration of specific pollutants, in parts of pollutant per million parts of air. (See CONCENTRATION.)

Air Quality Goals are expressions of desirable maximum pollutant concentrations to be achieved through a pollution control program.

Air Quality Standards are quantitatively-specified maximum levels of pollutant concentrations or dosages, as more precise statements of air quality goals.

ALERT STAGES

Alert Stages refer to critical levels of concentration or dosage signalling potential disastrous pollution effects and requiring emergency abatement and control measures.

ANALYSIS AREA (A.A.)

Analysis areas are used as the primary areal reference units for the data and issues throughout the game. The County is divided into a number of analysis areas, each of which is the approximate size of several census tracts. The analysis areas included in the five jurisdictions are as follows:

Jurisdiction 1 -- Central City: Ward 1 = AA 1 through AA 4
Ward 2 = AA 5 through AA 8
Ward 3 = AA 9 through AA 13

Jurisdiction 2 -- Suburb: AA 17 through AA 19

Jurisdiction 3 -- Township 1: AA 23 through AA 28

Jurisdiction 4 -- Township 2: AA's 14-16, 20-22, 29

Jurisdiction 5 -- County: AA's 1-29

(See APEX Analysis Area map)

ANNUAL WAGE

This is the annual cost to the Industrialist of one worker and is an average of the various rates of pay applicable to the different types of workers in the firm. The applicable average wage rate for each firm is reported in the Industrialist's output each cycle under cost factors.

ASSESSED VALUE

Assessed value is the value assigned to real estate property for purposes of assessing taxes owed to each of the Jurisdictions, County and school districts. Governments are required by law to maintain an assessed value of 50% of market value for property in their jurisdiction, although this requirement is often not met. (E.g. if a residential property is valued on the market at $20,000, its assessed value is $10,000.) (See STATE EQUALIZED VALUE.)

BOARD OF DIRECTORS

Each Industrialist acts as a Plant Manager and is responsible to the Board of Directors of his plant for his decisions and actions. The Board has the ultimate decision-making power in Plant affairs and may approve, amend or reject the Manager's fiscal policy proposal. The Board also sets the amount of dividends to be paid to the stockholders.

BONDING

Bonding is the process of incurring public debt to finance some capital improvement project. It is a device used to extend the incidence of costs over a long period of time, rather than have costs met out of current revenues while the project is under construction. Politicians may issue two kinds of bonds, general obligation bonds and revenue bonds. These differ in three respects: (1) the need for voter concurrence, (2) how they are paid off, and (3) the kinds of projects for which they are appropriate. Before Politicians may float general obligation bonds to finance projects, voters must approve this action in a referendum. There is a State-imposed limit on the indebtedness that a jurisdiction may incur through general obligation bonds. The amount of additional

bonded indebtedness that can be sought is indicated in the Politician's output as "$ Limit on Next Bond Sought".
(See DEBT RETIREMENT for the process of financing general obligation bonds.)
Revenue bonds are not submitted to a referendum and are appropriate only for particular projects. (Projects for which they may be used are noted in the Project List.) They are paid off through fees collected for the service provided by the facility, rather than by taxes.

CAPITAL PLANT INDEX (C.P.I.)

The capital plant index is a ratio of the present dollar value of public capital facilities (sewers, water lines, streets, parks and miscellaneous public holdings) to population equivalents. This number reflects the load imposed on facilities by residents, employees and clients, and thus is considered as an indication of the relative level of adequacy of these facilities. Present dollar value is calculated each cycle on the basis of depreciated value of existing facilities plus new facilities. (Facilities depreciate at about 5% of original value per year.)
(See POPULATION EQUIVALENT.)

CASH CARRYOVER

This is the cash reserve which an Industrialist or Developer carries over to the next cycle after making all his expenditures, including those for capital plant. It represents as-yet uncommited funds, which the player is free to use in the next cycle.

CASH TRANSFER

A cash transfer is used for loans or gifts of cash between players when the reason for the exchange is unspecified. Revenues made, or expenditures incurred, through an exchange of cash between either the Government, Industrialist, or Developer, are recorded in the budget section of the output. When applicable, cash transfers are also used to cover the cost of television time and newspaper articles.

COMBUSTION

Combustion is the process of burning fuel or wastes.

CONCENTRATION

Concentration is the ratio of pollutants to effluent gases or ambient air, measured in parts per million (ppm) as a volume to volume ratio, or micrograms per cubic meter (UG/cubic meter) as a weight to volume ratio. Data on mean concentration per quarter, concentration on worst day, and number of days above a specified concentration can be obtained by the APCO, through the installation and operation of monitoring stations.

CONTAMINANT See POLLUTANT

CONTROL EFFICIENCY

Control efficiency refers to the ratio of the amount of a pollutant removed from effluent gases by a control device to the total amount of pollutant without control.

CONTROL SYSTEM

Control system refers to equipment and/or procedures intended to reduce the amount of a pollutant, or pollutants, in effluent gases. Each gamed industrial firm has a limited set of control system options for each production or combustion process.

DEBT RETIREMENT (Debt Service)

Debt retirement, or debt service, is a term used to describe the process of paying off long-term general obligation bonds sold by public agencies. Debt retirement is a budget category of the Politician which includes expenditures for both principal and interest on general obligation bonds. Financing of these expenditures may be with either normal millage or debt retirement millage.

DEMOLITION COSTS (Clearance Costs)

A demolition cost of 5% of the assessed value of developed property must be paid when developed land is rezoned.

DENSITY

In residential areas, density is the term used to express the number of dwelling units per acre of land. In APEX a different density is associated with each of the five residential development types, with the lowest density found in land use category R-1 and the highest in category M-2.
The table on the following page expresses housing density in housing units per acre, and in acres per housing unit.

DEPRECIATION ALLOWANCE

Each cycle, the total value of capital facilities, (building and equipment) depreciate. A tax credit of 5% of the capital value facilities is allowed the industrialist to compensate for this depreciation. The amount is deducted before Federal and State income taxes are paid. The industrialist may claim any part of his maximum allowance; any portion of the allowance not taken will accumulate. The maximum depreciation allowance is listed under cost factors in the industrialist's output.

HOUSING DENSITY

AA	R-1		R-2		R-3		M-1		M-2	
	Units per Acre	Acres per Unit	Units per Acre	Acres per Unit	Units per Acre	Acres per Unit	Units per Acre	Acres per Unit	Units per Acre	Acres per Unit
1	1.4	.71	3.5	.29	5.6	.178	11.2	.089	21.0	.047
2	2.4	.41	6.0	.16	9.6	.104	19.2	.052	36.0	.027
3	2.0	.5	5.0	.20	8.0	.125	16.0	.062	30.0	.033
4	2.8	.35	7.0	.14	11.2	.089	22.4	.046	42.0	.023
5	2.1	.47	5.3	.18	8.4	.119	16.8	.059	31.5	.031
6	1.6	.62	4.0	.25	6.4	.156	12.8	.078	24.0	.041
7	2.5	.4	6.3	.15	10.0	.10	20.0	.050	37.5	.026
8	3.0	.33	7.5	.13	12.0	.083	24.0	.041	45.0	.022
9	1.2	.83	3.0	.33	4.8	.208	9.6	.104	18.0	.055
10	2.5	.4	6.3	.158	10.0	.10	20.0	.050	37.5	.026
11	1.0	1.	2.5	.4	4.0	.25	8.0	.125	15.0	.066
12	1.0	1.	2.5	.4	4.0	.25	8.0	.125	15.0	.066
13	1.0	1.	2.5	.4	4.0	.25	8.0	.125	15.0	.066
14	.5	2.	1.3	.76	2.0	.5	4.0	.25	7.5	.013
15	.6	1.66	1.5	.66	2.4	.41	4.3	.208	9.0	.011
16	.8	1.25	2.0	.5	3.2	.31	6.4	.156	12.0	.083
17	1.2	.83	3.0	.33	4.8	.208	9.6	.104	18.0	.055
18	2.3	.43	5.8	.172	9.2	.108	18.4	.054	34.5	.028
19	3.0	.33	7.5	.13	12.0	.083	24.0	.041	45.0	.022
20	.8	1.25	2.0	.5	3.2	.31	6.4	.156	12.0	.083
21	.5	2.	1.3	.76	2.0	.5	4.0	.25	7.5	.013
22	.4	2.5	1.0	1.	1.6	.62	3.2	.31	6.0	.16
23	.7	1.42	1.8	.55	2.8	.35	5.6	.178	10.5	.095
24	.3	3.33	.8	1.25	1.2	.83	2.4	.41	4.5	.022
25	.4	2.5	1.0	1.0	1.6	.62	3.2	.31	6.0	.16
26	.3	3.33	.8	1.25	1.2	.83	2.4	.41	4.5	.022
27	.6	1.66	1.5	.66	2.4	.41	4.8	.208	9.0	.011
28	.3	3.33	.8	1.25	1.2	.83	2.4	.41	4.5	.022
29	.5	2.	1.3	.76	2.0	.5	4.0	.25	7.5	.013

DEVELOPMENT TYPES AND COSTS

A. Residential

In APEX there are various levels of cost and density associated with different qualities and sizes of housing which may be built by Developers. These costs are for structures, exclusive of land and site improvements.

Single Family
Three different development-cost levels are applicable to APEX single-family housing units, ranging from the highest construction cost of $40,000 (designated as R-1) to the lowest cost housing, built at $15,000 per unit (designated as R-3). Any one of these types may be built on land which, when vacant, is zoned R.

Multiple Family
Units of two different cost levels, M-1 and M-2, are available for construction of multi-family housing in APEX. The highest cost per unit, for M-1, is $30,000 and the lowest, for M-2, is $12,000. Either of these types may be constructed on vacant land zoned M.

Residential Development Costs per Unit

R-1	R-2	R-3	M-1	M-2
$40,000	$22,500	$15,000	$30,000	$12,000

B. Commercial

Two types of commercial land use are allowable in APEX. These relate to local neighborhood shopping facilities and to regionally-oriented commercial and service facilities. Both may be built only on zoning category C land. Each is developed on a cost-per-acre basis, as follows:

Commercial Development Costs by Type

CL	CR
$100,000	$125,000

C. Industrial

Endogenous industrial development permitted Developers in APEX is on a per-acre basis, the cost being $100,000 per acre. Zoning category I land may be developed into this land use.

(See ZONING CATEGORY.)

DOSAGE

The specified time duration of an air pollutant's critical concentration level in a particular location, or for a particular person, material, etc., is known as dosage.

EFFLUENT

Effluents are the total gaseous emissions from production and combustion processes and activities, including air pollutants and non-noxious material.

ELITE OPINION POLL (E.O.P.)

The Elite Opinion Poll calls for a vote of all game players on certain major policy issues in the community. These issues appear as headlines in the M.E.T.R.O.-APEX News, which ask for either a deciding or advisory vote. The results of the Poll affect public officials' chances of re-election, as well as the probabilities of passage of general referenda and specific bond issue and special millage requests.

EMISSIONS

Emissions are pollutants in effluent or exhaust gases which are released into the air.

EMISSION FACTORS

Emission factors are estimates which can be used to approximate the rate of emissions of specific pollutants from generalized sources.

EMISSION MEASUREMENT

Air pollution emissions are measured in pounds per hour for particulates, sulfur dioxide (SO_2), carbon monoxide (CO), nitrogen oxides (NO_x), and hydrocarbons (HC); in Ringelmann number for smoke; and in Stinkelmann number for odor. The emissions measured are of specific pollutants from specific sources.

EMISSION RATE

Emission rate refers to the amount of pollutant emitted per unit of time. Maximum allowable emissions will be specified in pounds per hour if they refer to emission rates.

EMISSIONS SOURCE

An emission source is the origin of some specific air pollutants. In the game there are several gamed point sources, about thirty non-gamed point sources, plus motor vehicles and space heating as line and area sources, respectively.

EXOFIRM (EXOGENOUS FIRM)

An Exofirm is an industry or bureaucratic firm that depends primarily upon markets outside the local area for its growth and vitality. These firms are usually classified as Exofirms on the basis of their being net importers of dollars and net exporters of products or services to these outside markets. Jobs created by Exofirm growth spur additional growth of households and jobs oriented to the local market. (Exofirms are also often referred to as basic firms).
In APEX, Exofirms locate in zoning categories I and O.
Periodically, the newspaper will note the opportunity for Developers to invest, in a speculative way, in the entry of new Exofirms into the metropolitan area, with a variable probability of success attached to such investments. Occasionally, these Exofirms require rezoning of land and/or installation of special capital improvements. Requirements for such special public action and requests for private investment will be noted in the newspaper announcement of the firm's interest in locating in the area.

FUEL RATE

The amount of fuel consumed by each industry per unit of time is specified in tons/hours for coal, in barrels (bbl)/hour for oil, in thousand cubic feet (MCF)/hour for natural gas, and in megawatts (MW) for electricity.

FUEL TYPE

The fuel type possibilities include: low-grade coal (Lo-Coal), high-grade coal (Hi-Coal), low-grade oil (Lo-Oil), high-grade oil (Hi-Oil), natural gas, and electricity. The fuel option for each plant is listed in the Industrialist's output. The fuel grade refers inversely to the air pollution potential of the burning fuel, i.e., Lo-Grade has high pollution potential, and Hi-Grade fuels have low pollution potential.

HOUSEHOLD TYPES

The five household types used in APEX are characterizations of families belonging to fairly homogeneous socio-economic groups. These characterizations reflect life style, political involvement and voting habits, general consumption behavior and preference for public goods. There is substantial overlap of income levels for all status groupings; hence income, alone, is a weak indicator for characterizing households.

Household Type 1 -- is upper class and upper-middle class combined. Occupations of the heads of households are: professionals, technical workers, managers, officials, and proprietors. One-half of the family income levels are in excess of $15,000 and the other half are in the $10,000-$15,000 range. Value of housing is in excess of $20,000, and if they rent, rentals are over $150 per month. This is the group which is most concentrated in residential location. Education of the head of the household is at least college graduate, often with post-graduate study. Pressure group membership for this household type is found in the Chamber of Commerce and Good Government League.

Household Type II -- is the typical middle-class household in which the head's occupation is clerical, sales, or kindred types. Income of the family is primarily in the $7,000-$10,000 range. Education of the head of the household is some college or at least high school graduation. Housing value is primarily in the $15,000-$25,000 range, and gross rentals would usually be from $100 to $149 per month, though they may be somewhat lower. Pressure group affiliations for this type are with the Good Government League on the one hand, and with the ultra-conservatives on the other.

Household Type III -- the most numerous and widely-distributed of the five types is characterized by a mixed membership of very low income white collar workers, skilled craftsmen, and foremen, though the latter two predominate. In the outlying areas, farmers fall into this category. Family income is primarily in the $5,000-$9,000 range. The head of household's education is typically high school graduation. Housing value is usually in the $12,000-$20,000 range and rentals are from $80-$125 per month. Members of this group are apt to belong to the unions and/or the ultra-conservative pressure group.

Household Type IV -- is composed of semi-skilled workers, industry operatives and non-household service workers, such as waiters, barbers and parking-lot attendants. Family income is in the lower portion of the $4,000-$7,000 range. Housing values range from $10,000 to $14,000 with gross rentals being $70 to $90 per month. Education of the head of the household is usually 9 to 11 years. Pressure group membership for this household type is found in the unions and among the civil rights groups.

Household Type V -- is the lowest stratum of society, and heads of households are laborers or household service workers. The vast majority of the area's unemployed are of this type and roughly half of all members are elderly and retired. Family income is less than $5,000 annually and the value of housing is less than $10,000, with rentals primarily $50-$75 per month. Heads of households have usually not been educated beyond the eighth grade. Membership in pressure groups is found in the unions and civil rights groups.

Political involvement of the five household types declines from type I (the highest) to type V, the latter being generally apathetic. Likewise, concern with government operation and provision of public services is highest in type I households and declines steadily through type V families.
The five household types will tend to demand housing of the five residential development types according to the following percentages:

Household type I -- 50% will choose R-1; 30%, R-2, and 20%, M-1.
Household type II -- 20% will choose housing in each of the five development types.
Household type III -- 10% prefer R-1; 30% prefer R-2; 20% choose R-3; 25% take M-1, and 15%, M-2.
Household type IV -- 20% will choose R-2; 40%, R-3; 10%, M-1, and 30%, M-2.
Household type V -- 40% will be in R-3; 60% in M-2.

IMPROVEMENT COSTS

Improvement costs are fees to prepare raw land for development, including subdivision costs, sewer and water connections, drainage and engineering. Developers are required to pay improvement costs on all land on which they build structures. For residential property, improvement costs are on a per unit basis as follows:

R-1	R-2	R-3	M-1	M-2
$1,000	$800	$700	$600	$400

For commercial and local industrial land uses, improvement costs are on a per acre basis; for each the fee is $5,000 per acre.

These fees are automatically applied to all land on which the Developer builds.

INTEREST RATE

The cost of borrowing money will vary for the Industrialists and Developers according to both their credit rating and the length of the loan, i.e., how many years will be taken to repay it. Applicable interest rates are as follows:

	Credit Rating		
Years to Repay	A-1	A-2	A-3
1-2	4%	6%	8%
3-5	6%	8%	12%
6-10	8%	12%	16%
11-20	12%	16%	20%

The cost of borrowing money for governmental agencies -- the interest rate on bonds -- will vary according to the credit rating of the jurisdiction, and will differ between general obligation and revenue bonds. Since revenue bonds are not backed by governmental taxing power they are riskier and therefore carry higher interest rates than general obligation bonds. As a jurisdiction's credit rating falls from A-1 to A-3, the interest rate on general obligation bonds will increase from 4.5% to 6%.

ISSUE

Issue is used to refer to a problem situation presented to players in the APEX News. Following each issue are two to four alternatives from which one must be selected. (See ELITE OPINION POLL.)

JURISDICTION

Jurisdiction refers to one of the political units in APEX. Abbreviations used in the game are:

CC - Central City (Jurisdiction 1)
S - Suburb (Jurisdiction 2)
UT 1 - Township 1 (Jurisdiction 3 or Western Township)
UT 2 - Township 2 (Jurisdiction 4 or Eastern Township)
Co - County (Jurisdiction 5)

(See ANALYSIS AREA.)

LAND USE

Land use refers to the types of structures built upon particular pieces of land.

(See DEVELOPMENT TYPE and ZONING CATEGORY.)

MAXIMUM PRODUCTION CAPACITY

This is the maximum number of units which can be produced by a gamed industry in a cycle, given the plant and equipment in existence during that cycle. Maximum capacity may be increased by making capital expenditures for building and equipment. New productive capacity becomes available only in the cycle following that in which money is budgeted for plant expansion.

MILLAGE

Millage is the tax rate, in mills, which is applied to State equalized property value to generate property tax revenue. One mill is equal to a $1 charge on each $1000 of value, or one tenth of one percent of the State equalized value. There are three types of millage:

A. Normal Operating Millage is determined by local Politicians and is applied to standard operating costs of government by State and local law -- the local limit can never be higher than the limit set by the State.

B. Special Millage, which is not subject to State and local limits, can be used for financing special programs. It must be voted on in a referendum.

C. Debt Retirement Millage is not subject to the state and local limits but it can be used for retiring capital project bonds. This millage requires a favorable vote in a referendum.

Total millage is the sum of operating millage, any special millages and the debt retirement millages which may be in effect during the year.

MONITORING STATION

A monitoring station is a piece of equipment placed at a given location for measurement of air quality. An air quality monitoring station of one of five types may be installed and operated in any analysis area. The pollutants measured by each type of monitoring station are:

Type 1: Particulates
Type 2: Particulates and SO_2
Type 3: Particulates, SO_2, and CO
Type 4: Particulates, SO_2, CO, and NO_x
Type 5: Particulates, SO_2, CO, NO_x, and Hydrocarbons

PARTICULATES

Particulates are solid particle air pollutants, which may be suspended in the air or may settle out, depending on the size of the particles, wind speed, and other factors.

PLANT INSPECTION

A plant inspection is an "on-site" examination of production and pollution control equipment, processes and procedures. Plant Inspections ordered by the APCO will provide him with information on the production processes; production capacity; fuel and process rates; control systems; smoke code (Ringelmann number); and odor code (Stinkelmann number) for each process of a specific gamed or non-gamed emission source.

PLANT MANAGER

The player in the role of Industrialist is acting as a Plant Manager. (See BOARD OF DIRECTORS.)

POPULATION EQUIVALENT

The population equivalent is a means of converting (a) residents, and (b) employees and clients of industries and commercial facilties into a standard measure of the demand placed on such public capital facilities as sewers, streets, and water supply. The population equivalent of an area (analysis area or jurisdiction) is computed as follows:

P.E. =[Total households]+[.8 × all employees of commerce and industry]

For use of population equivalents in APEX, see CAPITAL PLANT INDEX.

PRESSURE GROUP

There are five pressure groups represented in APEX which take stands on public policy issues and can influence voter behavior. The more extreme the position assumed by the pressure groups, either pro or con, (as indicated by a scale of +4 to -4), the greater will be the voter turnout for referenda and elections. Each pressure group derives its constituency from members of two or more household types. (See HOUSEHOLD TYPES)

1. Civil Rights Groups -- find their leadership in the elite liberal and in ghetto activists. The majority of their followers come from lower social strata. These groups represent both Negroes and Mexican-Americans. The orientation of the groups is primarily toward what they consider bread-and-butter issues, such as fair employment, and toward actions which focus on the neighborhoods in which they live. Thus, the Civil Rights groups tend to be active in specific cases, but their influence is moderate.

2. Good Government League -- is overwhelmingly middle-class, composed primarily of professional people, a heavy percentage of them women. This group is interested in a wide range of issues, in which they exert moderate influence, and is oriented toward governmental efficiency and toward community growth and image.

3. Chamber of Commerce -- draws many members from the business community and some from professional groups such as law, engineering, and medicine. This group exerts the highest degree of power of all pressure groups and is oriented primarily toward community image and "boosterism". However, when an issue tends to split the business community, this group is likely to take no position.

4. Unions -- are more conservative locally than nationally and exhibit some divergency between craft unions and industrial unions, the former being more conservative. The unions exert moderate influence on a range of issues somewhat less broad than those of interest to the Good Government League. The conservatism of the unions is especially apparent in the opposition of some of its constituency to public spending for social welfare.

5. Ultra-Conservatives -- draw membership from people who are isolated from most community affairs. Although members have average incomes, the education level of most is lower than the community average. These groups become involved in public issues only sporadically, taking extreme and noisy positions when they feel personally affected by proposed public actions.

PROCESS RATE

Process rate refers to the amount of materials processed by an Industrialist per unit time. The measure is specified in tons, pounds, barrels, per minute, hour, etc.

PRODUCTION LEVEL

This is probably the key item determined by an Industrialist each cycle. It is the number of units of a product his plant will produce in that cycle. The Industrialist is free to set his production at any level he chooses, as long as the figure he sets does not exceed his maximum production capacity.

PRODUCTION PROCESS

A production process is a definable part of the overall production system

of a given firm. Each gamed industrial firm may have up to eight production processes, while each non-gamed industrial firm is assumed to have only one process.

QUASI-PUBLIC LAND

This is land owned by tax-exempt organizations such as churches and fraternal organizations. Such land includes church buildings and schools, cemeteries and such miscellaneous buildings as Elks lodges.

REFERENDUM

A referendum is a vote of the (simulated) population of a jurisdiction on some issue presented to the people by the Politician. Most usually referenda are called to approve (or reject) a general obligation bond issue or a request for special millage, although they may be called to approve some legislative matter, such as open housing.

REZONING APPLICATION FEE

The rezoning application fee is a charge of $100, which is assessed for each rezoning request submitted by a Developer or Industrialist. It is included in that player's financial statement for the next cycle.

RINGELMANN NUMBER

The Ringelmann Number is a code for measuring the blackness of smoke plumes and is equivalent to the opacity. Ringelmann Numbers and opacities are used for specifying allowable smoke emissions (Ringelmann for black and opacity for other colors). #0 = zero opacity, #1 = 20%, #2 = 40%, #3 = 60%, #4 = 80%, #5 = 100%. In APEX, all smoke readings are reported as Ringelmann Numbers.

STATE EQUALIZED VALUE

State equalization is a process designed to even out differences in assessment practices among political jurisdictions. The state equalization factor applied to each jurisdiction's assessed value will thus be different. The state equalized value for a jurisdiction, reached by applying the factor to local assessed value, is the base on which millage is levied to generate property tax revenues.

STINKELMANN NUMBER

The Stinkelmann Number is a code (developed in APEX) for measuring odor emissions, and for specifying maximum allowable odor emissions. Numbers range from 0-5, covering least to worst odor levels, respectively.

TAX RATE

See MILLAGE.

UNIT COSTS

The costs to the Industrialist of operating his plant are calculated, for each production component, except labor, on the basis of the amount and cost of each component required to produce one unit of the product. These unit costs apply to fuel, administrative overhead, inventory, and raw materials.

Fuel Cost applies to the fuel required to produce each Industrialist's product and will be different for each fuel type.

General Administrative Costs include all overhead expenditures, other than salaries, involved in production.

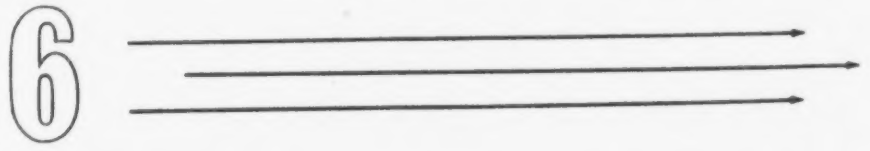
Inventory Carrying Costs must be paid to store product inventory from one cycle to the next. This cost excludes property taxes on inventory.

Materials Costs include all raw materials required to produce the product, except fuel.

The unit costs for each of these components which are applicable for a particular Industrialist for the next year are included in that player's output.

UNIT SALES PRICE

This is the price, which an Industrialist sets each cycle, at which he will sell a unit of his product. Each Industrialist has complete control over price, although the number of units he actually sells will be dependent on the relationship of his price to supply-demand conditions in the general market, and to the current average industry-wide price (reported for the last three years in the Industrialist's output).



ZONING CATEGORY

Zoning categories apply only to vacant land for APEX. Each of the six zoning categories may be developed into one or more types of land use:

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Zoning categories apply only to vacant land for APEX. Each of the six zoning categories may be developed into one or more types of land use:

FROM	TO
Zoning Category	Developed Land Use Type(s)
(1) R - Single-family residential	(1) R-1 (low density, high cost) (2) R-2 (medium density, medium cost) (3) R-3 (high density, low cost)
(2) M - Multiple-family residential	(4) M-1 (low density, low cost) (5) M-2 (medium density, low cost)
(3) C - Commercial	(6) CL (Commercial-Local) (7) CR (Commercial-Regional)
(4) I - Industrial	(8) I (endogenous industry) (9) I (exogenous industry)
(5) O - Bureaucratic	(10) O (exogenous bureaucratic)
(6) A - Agricultural	(11) A (active farming)

SECTION 3. INDUSTRIALIST ROLE DESCRIPTION

The Industrialist in APEX participates in his own independent business sub-game. Along with the Developer, he represents the economic interests of a segment of the private sector of APEX county. Only seven industries are included in the gamed component of APEX; an additional forty are simulated in the computer, and additional ones may enter from time to time. The roles of the gamed Industrialists are quite similar but each operates a distinct industry with unique characteristics. These include a power company, a pulp mill, a cement plant, a rendering plant, an iron foundry, a sulfuric acid plant and a vegetable farm.

The product of each of the gamed industries, except for the power plant, is marketed predominantly outside of APEX county. Thus, the success of each industry in generating revenue is tied to the regional or national economy. However, many of the factors influencing the cost patterns faced by the Industrialists are linked to the policies of APEX county; for example, those dealing with tax structure, capital plant infrastructure, local labor market and air pollution control. Most firms seek to maximize profits; however, other motivations and concerns can and should affect the decision processes of the firms of APEX county.

Each Industrialist serves as Plant Manager for his firm. As Plant manager, the Industrialist receives computer printout at the start of each cycle recording the results of his earlier decisions and providing the basis for the next round of decisions.

One of the major decisions that the Industrialist must make is the setting of his production level. Of course, this level must fall within the constraints of his existing plant capacity. When the production level is set, the employment level is automatically determined because there is a fixed ratio between production level and number of employees for each industry. Also, when the production level is set, the various operating costs associated with production are determined from fixed ratios. These include material costs, fuel costs, and general administration costs.

Another major decision involves the setting of the sales price for his product. The computer printout will show both his sales price and the average industry-wide price for the past three years. Using this history of the supply characteristics of the industry as a guide, as well as some independent demand estimates, the Industrialist can set his new sales price and estimate the volume he will sell.

The Industrialist also has the option to expand his physical plant, including equipment, buildings and land. However, he can not move his plant within the area. The size of the existing plant at the beginning of each cycle will set a maximum on productive capacity during that cycle. No Industrialist will be able to sell more than he can produce at maximum capacity -- plus what he carries over from the previous cycle in inventory. (An exception here is the Power Plant because it has no inventory.) To produce more than this limit, he may choose to expand his productive capacity. This is accomplished by adding to production equipment, a process that may also require increased building space and additional land. Such additions become useable or operational in the next cycle after the expenditures are made; therefore, there is a one-cycle lag between expenditures and increased capacity. The Industrialist should remember that depreciation will decrease his productive capacity each cycle unless balanced by expenditures to counter the deterioration of existing equipment.

The Industrialist may find it necessary to borrow money to pay for his plant's expansion and production costs. There is an externally imposed limit on the Industrialist's borrowing power reflecting his credit rating and overall indebtedness. There is an internally imposed limit as well -- his ability to meet payments including interest. The interest rate will be set according to the Industrialist's credit rating and the duration of the indebtedness period.

In weighing the success of his production and expansion decisions, the Industrialist will have to resolve trade-off between the demands of maintaining short-run liquidity and maximizing short-run profits and long-run business expansion goals. For example, the Industrialist may petition the Board of Directors of his company (the game director) to declare dividends thus cutting into retained earnings and reducing the availability of the ready resources needed to expand his operations.

In addition, a variety of activities over which he has little or no control will affect his financial success. The national economy will determine his actual sales, given the prices, and production level he sets. The national economy also establishes wage and administrative salary rates, material costs, inventory carrying charges, base interest rate on loans, and Federal and State income taxes. The effects of the local economy will be felt most directly through building costs, property taxes and air pollution control regulations.

While the Industrialist will have a large part of his attention focused on normal industrial and business operations, he will also have to deal with many compelling issues of community-wide interest. Probably the most important local issue that will involve the Industrialist is the air pollution problem. He may find that the County Politician and the APCO are seeking to improve air quality throughout the county. In the process, they may be concerned with pollutant emissions from the Industrialist's own production processes. They will be establishing regulations specifying the maximum allowable emissions and levels of fines for violations. When the Industrialist's pollutant emissions are above these limits, he can comply by installing pollution control systems and bearing the costs for initial investment and annual operations. (In some cases he can reduce these costs through recovery of valuable waste products.) He may also be forced to lower production or change fuels in order to comply with new regulations.

Obviously, the Industrialist will be concerned about the standards for maximum emissions approved by the County Politicians and he may seek to influence the standard-setting process. He may want to estimate for himself, using material in this manual, whether or not he is violating approved standards. Each Industrialist also has the option of buying information in the form of consultant surveys concerning both the emissions from his plant and the pollution control systems available to him. Finally, he may choose to argue, appeal, or take to court any alleged violation of air pollution regulations.

In addition to the decision options mentioned above, the Industrialist must make certain other decisions each cycle. He will be asked, as part of the elite of the community, to vote on public issues which arise in the newspaper and which call for an Elite Opinion Poll. He must also pay property taxes or risk having his land confiscated, and he must make payments on any outstanding loans or risk a drop in credit rating.

As a member of the community's elite, the Industrialist will be asked to vote on general obligation bonds and special millage requests during the play of the game. He may lend or give money to other players. He may have to work with the Planner and Politician to achieve a rezoning required for plant expansion or relocation. He may make campaign contributions for or against a Politician's re-election, and for or against a bond issue or special millage sought by a Politician. He may also run for election himself and challenge one

of the incumbent Politicians.

In summary, the major activities of the Industrialist are as follows:

-- Read the newspaper and vote in the Elite Opinion Poll
-- Pay taxes or risk confiscation of property
-- Make payments on outstanding loans or risk losing credit rating
-- Estimate potential market
-- Make trend estimate of, and then set, desired sales volume, sales price, production level, and operating costs
-- Decide on equipment and plant expansion, land purchases and rezoning if necessary
-- Take out loans to finance activities
-- Commission a consultant survey of plant emissions and/or control system data
-- Comply or argue with APCO's air pollution control requests
-- Make campaign contributions
-- Transfer cash to, or receive cash from, other players
-- Vote on bond issues or requests for special millage
-- Purchase land for expansion (but only with a Developer serving as his broker).

SECTION 4. ANNOTATED INDUSTRIALIST WORKSHEET

The Industrialist worksheet has five parts: (1) the Elite Opinion Poll, (2) Profit and Income Tax Estimation, (3) Capital Expenditure Estimation, (4) Loan Estimation, and (5) a News Release. You will be asked to fill out each part each year, and at the end of each cycle these decisions will be transferred to the computer. This worksheet will be the official record of your actions and decisions as Plant Manager of your industry.

You may make decisions in any order that is logical to you, and do not necessarily have to follow the order of the worksheet. The worksheet is merely to serve as a guide in the decision-making process.

I. ELITE OPINION POLL

Each year certain issues will appear in the APEX Gazette which require decisions from all role players, acting as the "elite" or power structure of the community. In some cases the decision of the elite is binding on the Politicians and the poll can be considered the same as submitting a referendum to the voters. Here the Gazette will read "DECIDED BY OPINION POLL MAJORITY." In other cases, the decision of the elite is merely advisory, and the Politicians can decide whether or not to heed their mandate. Here, the Gazette will read "POLITICIAN'S ULTIMATE DECISION BUT ELITE OPINION SOLICITED."

The outcome of the vote will be recapitulated in the next cycle's newspaper. For each issue outcome, the newspaper will also print the reactions of five pressure groups--Civil Rights Group, Good Government League, Chamber of Commerce, Unions, and Ultra-Conservatives.

Players should vote on all issues in the Elite Opinion Poll, including those of the Business Page. Each role will have one vote. In the cases where there is more than one person in a role, they will have to come to an agreement.

The Elite Opinion Poll is especially important to Politicians because their actions relative to the poll may affect their chances for re-election.

Instructions: Fill in the appropriate number for your role at the top left hand side of the page. Then put the cycle number on the right hand side. Put the issue number in the left hand column (this should not be confused with a project number), and the number of the alternative chosen in the adjacent column.

II. PROFIT AND INCOME TAX ESTIMATION

ESTIMATED INCOME

Estimated Income is the sum of Interest on Cash Available, Product Sales, Cash Transfers (from other players), and Land Sales.

A. Interest on Cash Available

The cash available for the upcoming cycle is found on the "Cash In-Cash Out Statement" of the printout under Section VI. The interest rate on this cash carryover is set permanently at 5%.

Instructions: Multiply the cash available by the interest rate of 5% to calculate the total interest on cash available.

Example:

A. Interest on Cash Available

1. Cash Available	900,000
2. Interest Rate	x .05
Total Interest on Cash Available	$45,000

B. Product Sales

Decisions in connection with product sales are all interrelated; however, a good place to begin is with the establishment of a unit sales price. (The Power Plant is an exception here because it is a publicly regulated utility; it submits all proposals for rate changes to the County Board of Supervisors for their approval.) To help in setting a sales price there is a comparison of the firm's unit price with the average price in the industry over the past three years under "Sales Information" on the printout. There are also newspaper headlines referring to the state of the national economy which may be indicative of demand potential. Once the sales price is set, an estimate can be made of the number of units to be sold in the coming year. Here again, under "Sales Information" in the printout, the history of both the estimated and actual sales for the past three years is recorded. Three factors determine your actual sales: (1) the state of the national economy, (2) the state of the local economy, and (3) the difference between the price set and the average for the industry. A multiplication of the units sales price with the estimated number of units to be sold results in the estimated revenue from product sales.

The next step concerns the setting of an inventory. There is a cost associated with each unit of inventory carryover which covers expenses such as building rental and moving fees. This can be found under "COST FACTORS" on the printout in Section E. In some cases, employee wages, material and fuel costs are rising so rapidly that it is wise to build up a large inventory despite the carrying costs. Each Industrialist must determine his own optimum inventory carryover. The desired inventory carryover added to the estimated unit sales yields the total units needed for the coming year. If there is an inventory carryover from the previous year, this is subtracted from that figure to give the estimated number of units that must be produced in the coming year. The inventory carryover from the previous year can be found under "PRODUCTION INFORMATION" on the printout. It is the number of units produced that year plus inventory carryover from a year prior to that, minus actual sales; i.e., units produced + inventory carryover - actual sales = inventory carryover to next cycle.

It should be noted that no Industrialist can sell more of his product than he can produce in a given year, plus whatever he carries over from the previous year in inventory. (Note: The Power Plant is an exception, since it can purchase power from outside sources if the demand is greater than its capacity). Each industry is limited in the total amount it can produce in a year by the number of plants in existence at the beginning of the year. Thus, plant size determines the Maximum Production Capacity for the year, which may be found under "PRODUCTION INFORMATION" on the printout.

The maximum production capacity can be increased by purchasing additional production equipment, which requires additional building, which in turn requires additional land. Expansion can occur only in multiples of the minimum production capacity increment; therefore, there is an associated minimum increment in equipment, building, and land. (See "BACKGROUND INFORMATION FOR INDUSTRIALIST ROLE" for these minimum increments.)

Each Industrialist should check his estimated production level for the coming year to see that it does not exceed the maximum production capacity for the year. By comparing the production capacity to the percent of capacity presently in use, the Industrialist can decide whether or not expansion is desirable. If the decision is made to expand, the section of the Industrialist Worksheet labeled "CAPITAL EXPENDITURE ESTIMATION" must be completed to initiate the appropriate expansion purchases. However, there will not be an increase in production capacity until the following year, because of the time lag associated with the construction of additional plant facilities.

Instructions: Establish a unit sales price and estimate sales (the number of units to be sold). Multiply to get estimated revenue from sales. Add the desired inventory carryover to estimated unit sales to determine the total units needed. Subtract actual inventory carryover from last year to get the estimated production level. Check to see that this does not exceed maximum production capacity.

Example:

B. Product Sales

1.	Sale Price	*$ 150/Ton*
2.	Estimated Sales (units)	*x 5000 Tons*
3.	Estimated Sales ($)	*$750,000*
4.	Estimated Sales (units)	*5000 Tons*
5.	Desired Inventory Carryover	*+ 300 Tons*
6.	Total Units Needed	*5300 Tons*
7.	Actual Inventory Carryover	*- 100 Tons*
8.	Estimated Production Level	*5200 Tons*

C. Cash Transfers (from other players)

The receipt of cash via a cash transfer should be recorded here. (The player transferring the cash should also record it under cash transfers to other players). The reasons for cash transfers between players are many and varied. They can represent fees for services rendered, indirect campaign contributions, loan agreements between players, and so forth. The results of cash transfer activities are recorded under "MISCELLANEOUS NOTES" on the printout.

Instructions: Indicate the player's role in the first column, the total amount of the cash transfer in the second, and the reason for the transfer in the third. Then total all estimated cash transfers.

Example:

C. Cash Transfers (from other players)

	Player	Amount	Reason
1.	*Ind. 2*	*$2,000*	*Loan payment*
2.	*Dev. 6*	*600*	*Consulting service*
3.			
	Total Cash Transfers	*$2,600*	

D. Land Sales

A final source of income for the Industrialist is through sale of land. The Industrialist's present land holdings are listed under "CURRENT PROPERTY HOLDINGS AFTER CYCLE ___" on the printout. It is possible for an Industrialist to sell his land to the market or to other game players. Land dealings can be handled through any of the Developers in the game. The fee for the service provided by the Developer in this context is negotiable and can be paid through cash transfers. (Note: Any increment of land less than 0.1 acre will not appear on your printout.)

Instructions: Column 1 indicates the analysis area in which the land is located; column 2, whether it is vacant or developed; and column 3, the zoning category of the land. This information can be found on the printout under "Current Property Holdings".

Column 4 names the player to whom you are selling the land. Columns 5 and 6 contain the number of units or acres to be sold; column 7, the agreed price per unit or per acre; and column 8, the product of the number of units or acres and the price per unit or acre. The sum of column 8 is the total expected income from land sales.

Example:

METRC-APEX -- S/ S/71 -- INDUSTRIALIST NUMBER 6 -- CYCLE 1, PAGE 72
PRINCIPLES OF AIR POLLUTION CONTROL TEAM 1

MISCELLANEOUS NOTES FROM CYCLE 1

CURRENT PROPERTY HOLDINGS AFTER CYCLE 1

(DEVELOPED RESIDENTIAL IN UNITS, ALL OTHER VALUES ARE IN ACRES)

		RESIDENTIAL					NON-RESIDENTIAL					
		SINGLE			MULTIPLE		COMMERCIAL		INDUSTRIAL		OFFICE	AGRICULT
AA	STATUS	R-1	R-2	R-3/	M-1	M-2	LOCAL	REGIONAL	LOCAL	EXCG.	EXCG./	
23	DEVELOPED	C	C	C	C	0	0.0	0.0	0.0	27.50	0.0	0.0

D. Land Sales

	AA	Vacant/ Dev.	Zone Cat.	Buyer	No. of Units	or	No. of Acres	Price/Acre Price/Unit	Total Price
1.	*23*	*dev*	*Ex I*	*Market*			*2*	*$40,000*	*$80,000*
2.									

Total Land Sales *$80,000*

ESTIMATED OPERATING COSTS

There are fourteen factors that contribute to operating costs: Labor Costs, Material Costs, Fuel Costs, General Administration Costs, Inventory Carrying Costs, Pollution Controls Operation, Plant Maintenance, Consultants for Pollution Emission Data, Consultants for Control Systems Data, Loan Payments, Property Taxes, Cash Transfers (to other players), Campaign Contributions, Zoning Application Fees and Demolition Costs. Each of these is described below.

A. Labor

For each industry there is a fixed ratio between the production level and the number of employees. This ratio can be found in this manual under "BACKGROUND INFORMATION FOR THE INDUSTRIALIST ROLE", Section 3. The Industrialist does not have an independent decision on the number of people he will employ. When the production level is set, the employment level is also determined. Normally, the Industrialists do not have an independent decision concerning employee wages either. The average annual wage for each industry is indicated on the printout under "COST FACTORS", Section A, and this will change each year.

Instructions: Take the employment/production ratio for your industry and multiply it by the estimated production level to estimate the number of employees. (Always round off where there is a fraction.) Multiply the number of employees by the average annual wage for that year. The result is the total labor cost.

Example:

A. Labor

1.	Estimated Production Level	*5,200 Tons*
2.	Employment/Production Ratio	x .01
3.	No. of Employees	*52*
4.	Average Annual Wage	x *7,500*
	Total Labor Cost	*$390,000*

B. Materials

There are material costs associated with each unit of production for every industry except the Power Plant. The unit material costs for each cycle can be found on the printout under "COST FACTORS", Section B.

Note: There are two cases where material cost may differ from the calculated cost described below. First, the Power Plant may buy power from other Generating Companies; this additional cost is shown under Material Cost. Secondly, when a usable by-product is recovered by pollution control equipment, the amount of revenue generated will be subtracted from the Material Cost. Thus it is possible that Material Cost may even appear in the printout as a negative value.

Instructions: Multiply estimated production level by unit material costs to get total material costs.

Example:

B. Materials

1.	Estimated Production Level	*5,200 Tons*
2.	Unit Material Costs	*$30.00*
	Total Material Cost	*$156,000*

C. Fuel

With the exception of the Iron Foundry, each Industry has several fuel options. These are enumerated under Section C of "COST FACTORS" on the printout. The fuel type presently in use can be found under Section M; however, there are several reasons why you, as an Industrialist, may want to change this. You may find that a fuel change will reduce production costs. The different fuel costs per unit product are indicated under "COST FACTORS". The costs associated with conversion from one fuel type to another are included in these unit fuel costs, amortized over ten years. You may also find that a fuel change will enable you to comply with air pollution control regulations. The percent of sulfur and the ash content for each fuel type is indicated in "BACKGROUND INFORMATION FOR INDUSTRIALIST ROLE", Section 5.

Instructions: Indicate the fuel type you choose. Then take the associated unit fuel cost and multiply it by the estimated production level to get the total fuel cost.

Example:

C. Fuel

1. Fuel Type	*low grade coal*
2. Estimated Production Level	*5,200 Tons*
3. Unit Fuel Cost	*$2.20*
Total Fuel Cost	

D. General Administration

The general administration costs per unit product can be found on the printout under "COST FACTORS", Section D. Along with average wage material and fuel costs, the general administration costs will change annually and should be checked each cycle.

Instructions: Multiply estimated production level by general administration costs per product unit to get the total general administration costs.

Example:

D. General Administration

1. Estimated Production Level	*300 Tons*
2. Unit General Admin. Cost	x *$4.24*
Total Inventory Carrying Costs	*$11,440*

F. Pollution Controls Operation

There are annual operating expenses associated with each air pollution control device in operation in a given year, including those to be installed during that year. Information on new controls may be obtained from a consultant survey. If this survey is purchased, there will be a page on the printout labeled "AIR POLLUTION CONTROL DATA" reporting the annual operating cost for each control system. Information on previously operating controls can be found on the printout under "INVENTORY ON PHYSICAL FACILITIES".

There are three possible operating states for control equipment; the first is the absence of control equipment, indicated by no printout; secondly, equipment may be installed and operating, indicated by a positive control number (i.e., Control System 32); the third operating state is installed, but not operating,

indicated by a negative control number (i.e., Control System 32). The player must decide whether or not to operate his equipment each cycle.

Instructions: In column 1 indicate the number of the production sub-process for which a control device exists or will be purchased this cycle. (A description of these sub-processes can be found under "Background Information for Industrialist Role", Section 1.)

In column 2 specify the type of control, and in column 3 the control number and in column 4 the annual operating costs. The sum of these costs is the total pollution control operating cost.

Example:

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PRINCIPLES OF AIR POLLUTION CONTROL TEAM 1

AIR POLLUTION CONTROL DATA PURCHASED BY

PROCESS	NAME	CONTROL SYSTEM NUMBER	NAME
1	COMBUSTION	1	LIMESTONE INJECTOR AND WATER SCRUBBER

INITIAL INVESTMENT	ANNUAL OPERATING COST	CONTROL EFFICIENCY PERCENT REDUCTION					/ UNIT REDUCTION	
		PART	SO2	CO	NOX	HC	/ SMOKE	CDCR
2500000.	400000.	90.0	95.0	0.0	20.0	0.0	/ 0	0

F. Pollution Controls Operation

	Production Sub-Process No.	Control Type	Control Number	Annual Operating Cost
1.	*1*	*Limestone*	*1*	*$400,000*
2.				
3.				

Total Pollution Controls Operating Costs *$400,000*

G. Plant Maintenance

Every year, depreciation causes a certain decrease in the production capacity of the plant unless balanced by plant maintenance expenditures. Without these expenditures, production capacity will decline at a rate of 8% per year. To maintain the present capacity, the plant maintenance rate is 8% of the value of your buildings and equipment. This value can be found under Section "J" of your printout. If plant maintenance expenditures are not made, production capacity will permanently decrease the next year. Thus, a decision to ignore maintenance should be accompanied by a re-estimation of production level (II-B of the worksheet).

II. Consultants - Pollution Emission Data

For a fee of $5000 you can hire an engineering consultant to perform stack sampling and analysis tests on all of the combustion and production processes of the industry. The consultant will provide information on the emissions, measured in lbs/hr, for five pollutants--particulates, sulfur dioxide, carbon monoxide, nitrogen oxides, and hydrocarbons. You will also be given the smoke emissions in Ringelmann numbers and the odor in Stinkelmann units. This information may differ from the emission estimates made by the Federal air pollution control authorities. Such differences are grounds for argument or appeal in Court, in the event that alleged violation of air pollution regulations are cited by the air pollution control authorities.

If a consultant survey is not ordered, it is possible to estimate emissions using the emission factors discussed in Chapter 7, Section 4 of this manual. However, these estimates of emissions are only rough figures which have limited value in court. When a consultant for pollution emission data is purchased, the information can be used in court. Such information appears on the printout below "COST FACTORS". An example of the information follows.

Example:

EMISSION DATA FROM SURVEY PURCHASED CYCLE 1

PRODUCTION PROCESS	CONTROL SYSTEMS INSTALLED AND OPERATING STATUS			EMISSION RATES (LB/HR) PARTICULATES	SULPHUR DIOXIDE	CARBON MONOXIDE	NITROGEN OXICES	HYDRO-CARBONS	SMOKE	ODOR
1	0	0	0	194.19	5870.79	0.0	2709.60	0.0	5	0

NOTE -- STATUS = POSITIVE WHEN CONTROL WAS OPERATED
STATUS = NEGATIVE WHEN CONTROL NOT IN OPERATION

I. Consultant - Control Systems Data

For a fee of $5000, a consultant will provide you with information about the various control systems available for the industry. The Federal air pollution control authorities may provide some general data on controls and the costs associated with them, but to get the specific data on controls for a particular plant one must obtain a consultant survey. In some cases there are no controls available for a particular production sub-process, and in other cases there are several to choose from. Controls will vary in initial investments costs, annual operating

costs, and control efficiency. Each figure under the section labeled "CONTROL EFFICIENCY", refers to the percent that a particular control will reduce a particular pollutant for a single production sub-process. If, after studying the control systems data, a decision is made to install some control equipment, entries must be made in the "CAPITAL EXPENDITURE ESTIMATION" section of the worksheet. An example of the type of information provided by the consultant for control systems data is given below.

Example:

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PRINCIPLES OF AIR POLLUTION CONTROL TEAM 1

AIR POLLUTION CONTROL DATA PURCHASED BY

PROCESS	NAME	CONTROL SYSTEM NUMBER	CONTROL SYSTEM NAME
1	COMBUSTION	1	LIMESTONE INJECTOR AND WATER SCRUBBER

INITIAL INVESTMENT	ANNUAL OPERATING COST	CONTROL EFFICIENCY PERCENT REDUCTION					/ UNIT REDUCTION	
		PART	SO2	CO	NOX	HC	/ SMOKE	ODOR
2500000.	400000.	90.0	95.0	0.0	20.0	0.0	/ 0	C

J. Loan Payments

Payments due each year on any outstanding loans are listed on the printout under "OUTSTANDING DEBITS", Section B. Each minimum payment due includes both principal and interest. The computer assigns a number of years left to pay off the loan, the interest rate, and the balance due. To pay off a loan early, payment of the balance due plus one year of interest is required. For example, a loan with a balance due of $5,000,000, and an interest rate of 4.5 percent with three years left to run needs a payment of $5,225,000 to erase the indebtedness. If on the other hand, the minimum loan payment is not met in a cycle, there will be an under payment penalty which will increase in severity for each payment not met. A repeated failure to meet loan payments will affect the Industrialist's credit rating, and hence the interest rates applied for future loans will be higher.

Instructions: In column 1 of the worksheet, enter the number of the loan assigned by the computer (found on your printout). In column 2 enter the amount of the loan payment, and then total all loan payments.

Example:

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PRINCIPLES OF AIR POLLUTION CONTROL TEAM 1

OUTSTANDING DEBITS

A. PROPERTY TAXES

	CURRENT		DELINQUENT AMT + 6.00 PERCENT		MIN PAYMENT DUE CYCLE 2
JURISDICTION 1 --	$ 0.	+ $	0.	=	$ 0.
JURISDICTION 2 --	$ 0.	+ $	0.	=	$ 0.
JURISDICTION 3 --	$ 38398.	+ $	0.	=	$ 38398.
JURISDICTION 4 --	$ 0.	+ $	0.	=	$ 0.
JURISDICTION 5 --	$ 4126.	+ $	0.	=	$ 4126.

SUBTOTAL -- DUE IN CYCLE 2 $ 42524.

B. LOANS

AC.	BALANCE	RATE	YRS LEFT	UNDERPAYMENT PENALTY	MIN PAYMENT DUE CYCLE 2
3	$ 539579.	6.0	3	$ 0.	$ 202017.
SUBTOTALS	$ 539579.				$ 202017.

J. Loan Payments

Loan Number	Amount
1. *3*	*$202,014*
2.	

Total Loan Payments *$202,014*

K. Property Taxes

Each Industrialist must pay taxes to the jurisdiction in which his plant is located as well as to the County. If land is purchased in other jurisdictions, property taxes must be paid there too. Failure to pay taxes results in a penalty of 6%. There is also the risk that property may be confiscated by the jurisdiction in which taxes are owed. The taxes due each cycle to the various jurisdictions are recorded on the printout under "OUTSTANDING DEBITS", Section A. The tax rate is set by the Politicians and is a highly sensitive political issue.

Instructions: In column 1, enter the jurisdiction to which taxes are to be paid, and in column 2, the amount to be paid. The sum of these payments is the total payment for property taxes.

Example:

```
METRC-APEX --  9/ 9/71                    -- INDUSTRIALIST NUMBER  6 --          CYCLE  1.
 PRINCIPLES OF AIR POLLUTION CONTROL                                             TEAM   1


     OUTSTANDING DEBITS

        A.  PROPERTY TAXES                                DELINQUENT AMT          MIN PAYMENT
                                          CURRENT      + 6.00 PERCENT          DUE CYCLE  2

            JURISDICTION 1 --        $        0.    + $        0.  =    $        0.
            JURISDICTION 2 --        $        0.    + $        0.  =    $        0.
            JURISDICTION 3 --        $    38398.    + $        0.  =    $    38398.
            JURISDICTION 4 --        $        0.    + $        0.  =    $        0.
            JURISDICTION 5 --        $     4126.    + $        0.  =    $     4126.

                SUBTOTAL -- DUE IN CYCLE  2                                          $    42524.
```

K. Property Taxes

	Jurisdiction	Amount
1.	*3*	*$38,398*
2.	*5*	*4,126*
3.		

Total Property Taxes *$42,524*

L. Cash Transfers (to other players)

Cash transfers are used for many different purposes. One common use is to pay a land developer to deal with the market in buying or selling land for you. Another common use is for loans between players. A third use is to pay for space in the APEX News or for broadcasting time which can be used to advertise products, make campaign speeches, or publicize activities. A record of all cash transfers appears under "MISCELLANEOUS NOTES" on the printout.

Instructions: Enter the name of the recipient of the cash transfer in the first column, the amount of the cash transfer in the second column, and the reason in the third. The reason for the transfer is not a required entry.

Example:

L. Cash Transfers (to other players)

	Player	Amount	Reason
1.	*Dev. 5*	*$600*	*Consulting Services*
2.	*Game Op*	*$200*	*2 lines in News*
3.			

Total Cash Transfers *$800*

M. Campaign Contributions

Campaign Contributions can be made for or against incumbent Politicians. As an Industrialist, it is possible to run for election yourself by challenging one of the Politicians from your Jurisdiction. To run for election, one must simply declare an intent to run at least one cycle before the election. If more than one player decides to run against a particular Politician, a caucus will be required to identify a single opponent in the election. If no player chooses to run against a particular Politician, a simulated opponent will stand in. In this case, a campaign contribution against the incumbent is a contribution for the opponent simulated by the computer. In addition to contributions for Politicians, it is possible to make contributions for or against bond issues or special millages. The bond or millage numbers must correspond to numbers on the bond and special millage requests submitted by the Politicians.

Instructions: In column 1, enter the target of the contribution (the Politician or the bond or special millage number). In column 2, enter the amount of the contribution, and in column 3, whether it is for or against the Politician, bond or special millage. Then, total all contributions.

Example:

M. Campaign Contributions

Pol/Bond/Mill No.	Amount	For or Against
1. *CC Pol-Ward 1*	*$5000*	*for*
2. *Bond No. 412*	*2000*	*against*

Total Campaign Contributions *$7,000*

N. Zoning Application Fees and Demolition Charges

There is a fee of $100 charged for each rezoning request. All land that is used for plant expansion must be zoned vacant industrial before it is developed. Assistance may be secured from the Developers in land transactions and zoning. When your developed property is rezoned, a demolition charge of 5% of the land value is collected, and the property becomes vacant. Zoning application forms can be obtained from the Planners and they will assist you in filling them out. The Planners will schedule an open hearing with the Politicians, who will make the final determination.

It should be noted that all rezoning requests should have the planner's recommendation and must have the signatures of the majority of the appropriate Politicians (the majority of the City Politicians if the land is within city limits, or the majority of the County Politicians for all other land). Rezoning requests can be submitted by the Industrialist only for land that he owns. Any rezoning actions will be recorded under "MISCELLANEOUS NOTES" on the printout. The "CURRENT PROPERTY HOLDINGS" also reflect all zoning changes.

Instructions: In column 1 record the analysis area of the land you would like to have rezoned and in column 2 indicate whether this land is presently vacant or developed. Then in column 3 indicate the present zoning category, or the developed land use type, whichever is appropriate. Column 4 should contain the desired new zoning category. (Note that when property is rezoned, it automatically becomes vacant.) Column 5 should show the number of units of the land if it is developed residential. If it is developed non-residential or vacant indicate the number of acres in column 6. A fee of $100 goes in column 7. (Note: This form is not a rezoning request. It is merely a record of the zoning requests that you have submitted through the Planners.)

Example:

N. Zoning Application Fees and/or Demolition Costs

	A.A.	Vac/ Dev.	From	To	No. of Units	or	No. of Acres	Fee
1.	*5*	*vac*	*Res*	*Ind*			*5*	*$100*
2.								
3.								

Total Zoning Application Fees *$100*

1. Value of Dev. Land being Rezoned _____
2. Rate of Demolition Fees x _____

Total Demolition Charges $ _____

ESTIMATED NET PROFIT

To estimate net profit, first calculate the gross profit. This is the difference between the estimated total income and estimated total operating costs. At this point the Industrialist has the option of claiming a tax depreciation allowance on the accumulated depreciation of his buildings and equipment. (See Glossary for definition of tax depreciation.) The tax depreciation allowance

rate is set at 5% of the value of buildings and equipment; however, the Industrialist may choose to carry over this allowance and claim the accumulated total during some later cycle. The maximum allowable claim for tax depreciation is printed under "COST FACTORS" on the printout, in Section H. This maximum includes any amounts not claimed in previous cycles.

The tax depreciation allowance claimed during any single year is subtracted from gross profit to give the total taxable income. At this point Federal and State Income Taxes are determined at a rate of 55% of the total taxable income. Subtracting these taxes from the total taxable income yields an estimate of net profit for the next cycle.

It is one of the duties of your Board of Directors (Game Operator) to review the Profit and Income Tax Estimations to determine what proportion of the net profit should be paid to stockholders in the form of dividends, what amount should be used to decrease indebtedness, what amount should be reinvested in the corporation, and so forth. As Plant Manager, the Industrialist can recommend the amount that should be taken out in dividends, but should include an explanation of the strategies and goals for the overall plant operations. All such recommendations will be considered by the Board of Directors as they make their decisions.

III. CAPITAL EXPENDITURE ESTIMATION

A. Desired Increase in Maximum Production Capacity

The decision to increase maximum production capacity revolves around several interrelated factors. For each industry, there is a set ratio between equipment value and production capacity, between building area and equipment value, and between land area and building area. These ratios can be found "BACKGROUND INFORMATION FOR INDUSTRIALIST ROLE", Section 4, and they will remain constant throughout the APEX exercise. For each Industry, there is also a fixed minimum production capacity increment. Using the above ratios, a corresponding minimum has been established for equipment purchases, building purchases, and land requirement. Again, using the above ratios, it is clear that building area sets a limit on the amount of equipment that can be added; likewise land area sets a limit on the building area that can be added. Under "INVENTORY OF PHYSICAL FACILITIES", the printout shows how much additional square footage of building can be accomodated by the vacant land held by the firm.

Note that it is possible to buy land in any amounts in any cycle without additional investment in buildings and equipment. If there is enough land area, building area can also be increased without adding equipment and, similarly, if there is enough building area, equipment can be added without increasing the level of production. However, to increase production level, equipment must be added in multiples of the minimum equipment increment. This increase in equipment value will result in a corresponding increase in production capacity, and the new maximum capacity will be indicated on the printout under "PRODUCTION INFORMATION".

There is a one cycle delay between expansion purchases and the time the increased production capacity can be used. It is the Industrialist's job, as Plant Manager, to look not only at the percent of production capacity presently being used, but also to estimate how this will change over the coming cycles. In some cases he must start planning for expansion several years before the increased capacity is needed. For example, there may be no vacant land zoned industrial in the appropriate analysis area. This could necessitate going to the Developers to buy some Market owned land, or going to the Planners to see how rezoning requests fit into their master plan, and/or going to the Politicians to get final approval for rezoning requests. All of these possibilities could result in several cycles of delay. With careful planning, the Industrialist can anticipate the needs of his industry for the coming cycles. In summary, the factors that should be considered in setting a desired increase in production capacity are: (1) equipment expenses, (2) building expenses, and (3) land purchase cost.

B. Production Equipment Expansion

The production equipment expansion should correspond with the desired increase in production capacity. For example, if production capacity is set at two times the minimum production capacity increment, the equipment purchases should represent two times the minimum equipment increment. These expenses will appear on the printout on the "CASH IN-CASH OUT STATEMENT" under Capital Expenditures.

C. Building Expansion

The building expansion should also correspond with the desired increase in production capacity and with the increase in equipment. Again, if the increase in production capacity is set at two times the minimum increment, the building expansion should be two times the minimum building increment. This expense will also appear on the "CASH IN - CASH OUT STATEMENT" under Capital Expenditures.

D. Land Purchases

If land purchases are needed for expansion, they should also be in multiples of the minimum land increment that correspond to the desired increment in production capacity. This land should be zoned vacant industrial and must be in the same analysis area as the rest of the plant. For the purposes of this game, any parcel of land that is in the same analysis area is assumed to be adjacent to the plant. Information concerning the availability of parcels of land and the appraised and market values can be obtained through Land Developers. If the land is to be used for expansion purchases, a rezoning request to change the land to a vacant industrial zoning category may have to be initiated. Rezoning requests can be obtained from the Planners and must have the approval of the majority of appropriate Politicians in order to be enacted. The Industrialist should record the rezoning request and amount for any rezoning fees under "ESTIMATED OPERATING COSTS" on the "PROFIT AND INCOME TAX ESTIMATIONS" section of this worksheet.

When the Industrialist considers buying land that needs rezoning, he is wise to check on the likelihood of approval before actually purchasing the land. As mentioned earlier, it is possible to buy land several cycles prior to the actual expansion of plant capacity. In some cases, it is well to spread expansion purchases over several cycles. However, there are tradeoffs associated with such activity--property taxes increase when more land is held, whether or not it is being used for plant production.

Industrialists also have the option to engage in some limited land speculation activities. It is possible to make a profit by buying, rezoning, and selling land to the market and/or to other game players. The same section of the worksheet is used whether you are buying land for expansion purposes or for speculation purposes. In either case, a record of the land purchase will appear under "MISCELLANEOUS NOTES" on the printout under the section labeled "REAL ESTATE TRANSACTIONS". The expenses will also appear as Capital Expenditures on the "CASH IN-CASH OUT STATEMENT".

Instructions: In column 1 enter the name of the player from whom you are buying land, and in column 2 the analysis area of the land. Use column 3 to show whether the land is vacant or developed at the time of purchase and column 4 to indicate the zoning category or developed land use type. Use column 5 to show the number of units involved if the land is developed residential; otherwise use column 6 to show the number of acres involved. The negotiated price per acre or per unit should appear in column 7, and the total price in column 8. Finally, total all land purchases.

Example:

D. Land Purchases

	Seller	AA	Vacant/ Dev.	Zoning Cat.	No. of Units	or	No. of Acres	Price/Acre Price/Unit	Total Price
1.	*Ind 1*	*15*	*vac*	*Ind*			*5.3*	*30,000*	*159,000*
2.	*Dev 5*	*6*	*dev*	*R-2*	*10*			*21,000*	*210,000*
3.									

Total Land Purchases *$ 369,000*

E. Pollution Control Equipment

Initial investments in pollution control equipment should be recorded in this section of the worksheet. The purchase of control equipment should be preceded by the purchase of a consultant for control systems data. This consultant survey will provide you with all the information necessary to purchase air pollution controls for your Industry. In addition to the initial capital investment in control equipment, you must plan for annual operating costs (under Section II-F of "PROFIT AND INCOME--TAX ESTIMATION" on your worksheet). After the first year, however, you have the option of owning the control device but not operating it. The purchase of pollution control equipment will be recorded on the printout under "INVENTORY OF PHYSICAL FACILITES", and it will also be recorded under Capital Expenditures on the "CASH IN-CASH OUT STATEMENT".

Instructions: All the information needed in this section will be found in the consultant survey which will be on the last page of the printout. In the first column, put the number of the production sub-process. In the next column, put the control type to be purchased and follow that with the control number. In the last column put the initial cost. Finally, total all purchases.

Example:

METRC-APEX -- 9/ 9/71 -- INDUSTRIALIST NUMBER 1 --
PRINCIPLES OF AIR POLLUTION CONTROL

AIR POLLUTION CONTROL DATA PURCHASED BY

PROCESS	NAME	CONTROL SYSTEM NUMBER	CONTROL SYSTEM NAME
	COMBUSTION	1	LIMESTONE INJECTOR AND WATER SCRUBBER

INITIAL INVESTMENT	ANNUAL OPERATING COST	CONTROL PERCENT REDUCTION			
		PART	SO2	CO	NOX
2500000.	400000.	90.0	95.0	0.0	20.0

E. Pollution Control Equipment

	Process No.	Control Type	Control Number	Initial Cost
1.	*1*	*limestone*	*1*	$ *400,000*
2.				
3.				

Total Pollution Control Equipment Cost $ *400,000*

IV. LOAN ESTIMATIONS

In estimating the need for new loans, a distinction between two types of cash requirements must be made. The first is cash requirements that can be met at any time during the year, and the second is cash requirements that must be met at the beginning of the year. By using the categories under the "CASH IN-CASH OUT STATEMENT" on the printout a cash flow picture can be determined, and the cash carryover for the coming year can be estimated. If there is a cash deficit at this point, a new loan is needed to increase the total Cash In. However, it is possible to have a cash surplus at this point, and still need a new loan. This is because there are certain cash requirements that have to be met at the beginning of the year such as property taxes, loan payments, and expansion purchases. These payments cannot come from income anticipated during the year. There must be enough cash left over from the previous year to cover these costs--if not, a new loan is needed.

It is possible, of course, to request a new loan at any point, even if the firm has a cash surplus. Any loans requested from the computer will automatically be granted at the beginning of each cycle, as long as the total of all new loans requested does not exceed the maximum loan possible. This limit is on the printout under the "CASH IN-CASH OUT STATEMENT", Section VII. - D. The maximum new loan possible is related to net worth and existing indebtedness. The credit rating for each year will be indicated in this same section of the printout. The interest rate depends on the firm's credit rating and on the number of years taken to repay the loan. The maximum number for a loan is 20 years. The following chart indicates how interest rates will vary:

Years to Repay	Credit Rating		
	A-1	A-2	A-3
1-2	4%	6%	8%
3-5	6%	8%	12%
5-10	8%	12%	16%
11-20	12%	16%	20%

Failure to meet loan payments lowers the firm's credit rating. When a new loan is approved, the computer assigns the appropriate interest rate and records it on the printout under "OUTSTANDING DEBITS", in Section B.

Instructions: From the printout on the "Cash In-Cash Out Statement", find the cash available and add 5 percent interest to it. Then add to this any income anticipated from cash transfers to get the total cash on hand. Subtract from this all initial cash requirements which are as follows: (1) property taxes, (2) loan payments currently due, (3) capital expenditures, (4) campaign contributions, and (5) cash transfers (to other players). Using sound judgment, determine the amount of any new loan requests. In the first column put the number of years for repayment, and in the second column, the amount of the loan requested.

(SEE EXAMPLE ON FOLLOWING PAGE)

Example:

IV. LOAN ESTIMATIONS

A. Cash on Hand

1.	Cash Available	$836,050
2.	5% Interest on Cash Available	41,802
3.	Cash Transfers (from others)	+$ 0
	Total Cash on Hand	$877,852

B. Initial Cash Requirements

1.	Property Taxes	$1,506,000
2.	Loan Payments (currently due)	$ 56,135
3.	Capital Expenditures	$ 100,000
4.	Campaign Contributions	$ 130,000
5.	Cash Transfers (to others) +	$ 369,000
	Total Initial Cash Requirements	$2,161,135

C. Loan Requests

	Years for Repayment	Amount of Loan
1.	4	$2,000,000
2.		
	Total Loan Requests	$2,000,000

V. NEWS RELEASE

Players may at any time submit articles or headlines that they would like to appear in the APEX Gazette. If the editorial staff of the Gazette deems the article "newsworthy", there will be no cost. This generally applies to articles submitted by public agencies--i.e. Federal air pollution control authorities, Politicians, Planners. Otherwise, the cost will be on the order of $100 per line of 120 characters.

All articles are subject to review by the editorial staff.

5-1

INDUSTRIALIST'S WORKSHEET

I. ELITE OPINION POLL

Industrialist Number _____ Cycle Number _____

ISSUE	ALTERNATIVE

Industrialist Number _____ Cycle Number _____

II. PROFIT AND INCOME TAX ESTIMATION

ESTIMATED INCOME

A. Interest on Cash Available

1. Cash Available _____

2. Interest Rate x .05

Total Interest on Cash Available $ _____

B. Product Sales

1. Sales Price _____ *

2. Estimated Sales (units) x _____ *

3. Estimated Sales ($) $ _____

4. Estimated Sales (units) _____

5. Desired Inventory Carryover + _____

6. Total Units Needed _____

7. Actual Inventory Carryover - _____

8. Estimated Production Level _____ *

C. Cash Transfers (from other players)

	Player	Amount	Reason
1.			
2.			
3.			
4.			
5.			

Total Cash Transfers $ _____

D. Land Sales

	AA*	Vacant/ Dev.*	Zoning Cat.*	Buyer*	No. of Units* or	No. of Acres*	Price/Acre Price/Unit*	Total Price
1.								
2.								
3.								
4.								
5.								

Total Land Sales + $ _____

TOTAL ESTIMATED INCOME $ _____

ESTIMATED OPERATING COSTS

A. Labor

1. Estimated Production Level _____
2. Employment/Production Ratio x _____
3. No. of Employees _____
4. Average Annual Wage x _____

Total Labor Cost $ _____

B. Materials

1. Estimated Production Level _____
2. Unit Material Costs x _____

Total Material Cost $ _____

C. Fuel

1. Fuel Type _____ *
2. Estimated Production Level _____
3. Unit Fuel Cost x _____

Total Fuel Cost $ _____

D. General Administration

1. Estimated Production Level _____

2. Unit General Administration Cost x _____

Total General Administration Cost $_____

E. Inventory Carrying Costs

1. Desired Inventory Carryover _____

2. Unit Inventory Carrying Costs x _____

Total Inventory Carrying Costs $_____

F. Pollution Controls Operation

	Production Sub-Process No.*	Control Type	Control Number*	Annual Operating Cost*
1.				
2.				
3.				
4.				
5.				

Total Pollution Controls Operating Costs $_____

G. Plant Maintenance $_____*

H. Consultants - Pollution Emission Data $_____*

I. Consultants - Control Systems Data $_____*

J. Loan Payments

	Loan No.*	Amount*
1.		
2.		
3.		
4.		
5.		

Total Loan Payments $_____

K. Property Taxes

	Jurisdiction*	Amount*
1.		
2.		
3.		
4.		
5.		

Total Property Taxes $ _____

L. Cash Transfers (to other players)

	Player*	Amount*	Reason
1.			
2.			
3.			

Total Cash Transfers $ _____

M. Campaign Contributions

	Pol/Bond/Mill No.*	Amount*	For or Against
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			

Total Campaign Contributions $ _____

N. Zoning Application Fees and/or Demolition Costs

	A.A.	Vac/ Dev.	From	To	No. of Units	or	No. of Acres	Fee
1.								
2.								
3.								
4.								

Total Zoning Application Fees $ _____

1. Value of Dev. Land being Rezoned _____

2. Rate of Demolition Fees x .05

Total Demolition Costs + $_____

TOTAL ESTIMATED OPERATING COSTS $_____

ESTIMATED NET PROFIT

A. Gross Profit

1. Total Estimated Income _____

2. Total Estimated Operating Costs - _____

3. Estimated Gross Profit $_____

B. Tax Depreciation Allowance

1. Maximum Tax Depreciation Allowance _____

2. Desired Tax Depreciation Allowance - $_____*

C. Total Taxable Income $_____

D. Federal and State Income Taxes

1. Total Taxable Income $_____

2. Fed-State Income Tax Rate x $.55

Total Federal and State Income Taxes $_____

E. Estimated Net Profit

1. Estimated Gross Profit $_____

2. Total Federal & State Income Tax -_____

TOTAL ESTIMATED NEW PROFIT $_____

RECOMMENDED DIVIDENDS _____

Explanation for Board of Directors: _____

_____

_____

III. CAPITAL EXPENDITURE ESTIMATION

A. Desired Increase in Maximum Production Capacity _____

B. Production Equipment Expansion $_____*

C. Building Expansion $_____*

D. Land Purchases

	Seller*	AA*	Vacant/ Dev.*	Zoning Cat.*	No. of Units*	or No. of Acres*	Price/Acre Price/Unit*	Total Price
1.								
2.								
3.								
4.								
5.								

Total Land Purchases $_____

E. Pollution Control Equipment

	Process No.*	Control Type	Control Number*	Initial Cost
1.				
2.				
3.				
4.				
5.				

Total Pollution Control Equipment Costs + $_____

TOTAL CAPITAL EXPENDITURES $_____

IV. LOAN ESTIMATIONS

A. Cash on Hand

1. Cash Available $_____

2. 5% Interest on Cash Available $_____

3. Cash Transfers (from others) + $_____

Total Cash on Hand $_____

B. Initial Cash Requirements

1. Property Taxes $ _____

2. Loan Payments (currently due) $ _____

3. Capital Expenditures $ _____

4. Campaign Contributions $ _____

5. Cash Transfers (to others) + $ _____

Total Initial Cash Requirements $ _____

C. Loan Requests

	Years for Repayment*	Amount of Loan*
1.		
2.		
3.		

Total Loan Requests $ _____

Cycle Number _____

V. NEWS RELEASE

The following should be printed in the APEX Gazette: (please write clearly)

NAME_____ ROLE _____

Section 7-1

BACKGROUND INFORMATION FOR INDUSTRIALIST ROLE: SHEAR POWER COMPANY

1. Description of Firm

The Shear Power Company was established in 1927. Last year the plant produced a total of 2,969,103 megawatt-hours of electrical energy and sold it all for a gross revenue of $29,691,030. The plant employed 534 people at an average yearly wage of $7,575.00.

The plant occupies a nineteen acre site in analysis area 8. No further company-owned land is available at the present site for plant expansion. Current land is appraised at a market value of $760,000; building at $17,000,000; and equipment at $55,000,000.

Equipment and buildings have been found to decrease in productive capacity at a rate of 8% per year due to wear and aging. They must be maintained by repair and replacement each year or the plant's productive capacity will permanently decline the following year. A maintenance expenditure of $5,760,000 is required this year to maintain present productive capacity. For later years additional maintenance costs will rise if building and equipment are expanded.

The Shear Power Company can produce a maximum of 9041 megawatt-hours per day with its 500 megawatt generator. Combustion, to produce the steam to run the generator, is the only process with major air pollution potential. The chart on the following page gives the types of emissions given off from the combustion process.

Process No.	Type	Hours Day	Materials Hour	Air Pollution Emissions
1.	Combustion	24	*	P, SO_2, NO_x, Smoke

*Fuel Rate, see below

The major fuel options for this firm are listed below, along with key cost, production and emission factors. Fuel changes can be made without investment in new combustion equipment. Fuel prices for each cycle will be reported in the firm's computer output. Fuel cannot be stored for next cycle.

Fuel No.	Type	Fuel MWH	Price Unit Fuel	1000 BTU Unit Fuel	% Sulfur	% Ash
1.	Low Grade Coal	0.31 tons	$7.00/ton	18,000/ton	4.4	10.0
2.	High Grade Coal	0.28 tons	$9.00/ton	20,000/ton	1.2	5.5
3.	Low Grade Oil	1.34 bbls	$1.50/bbl	4,200/bbl	1.6	1.0
4.	High Grade Oil	1.25 bbls	$2.30/bbl	4,500/bbl	0.4	0.5
5.	Natural Gas	9.38 MCF	$0.50/MCF	600/MCF	0	0

2. Price - Production Record

The graph on the next page show the past record of the firm in terms of unit price charged, production level, sales, and inventory carryover. The top graph describes the price record for this firm in relation to price for the entire industry. The bottom graph indicates how much of the firm's sales came from current production and how much from inventory carryover for the past three years. The computer output for each cycle will report on production, sales, and inventory for the most recent three years. Fuel inventory is not included.

3. Key Production Relationships and Minimum Increments - Industry #1

$\frac{\text{Employment}}{\text{Production Level}}$	=	0.00018 Employees per Megawatt - Hour Production
$\frac{\text{Equipment Value}}{\text{Production Capacity}}$	=	$15.72 per Megawatt Capacity
$\frac{\text{Building Area}}{\text{Equipment Value}}$	=	0.01 sq. ft. Building Area per $ Equipment Value
$\frac{\text{Land Area}}{\text{Building Area}}$	=	0.000035 Acres of Land per sq. ft. Building Area

Minimum Production Capacity Increment = 700,000 Megawatt Hour Capacity

Minimum Equipment Increment = $11,000,000

Minimum Building Increment = $3,400,000 (110,000 sq. ft.)

Minimum Land Increment = 3.8 Acres (zoned Vacant Indust.)

4. Emission Factors

Emission factors are used to make a very rough estimate of the pollution emitted from an uncontrolled air pollution source. The following emission data set has been specifically adapted to the APEX game and should not be used for reference except in the game.

The emission rate for a production process may be estimated by multiplying the production rate by the emission factor for the appropriate type of industry. For example, if the pulp produces 300 tons of pulp per day, an estimate of particulate emission can be determined as follows:

$$(300 \text{ tons/day}) \times \left(\frac{15 \text{ lbs./hr. of Part.}}{\text{tons/day}}\right) = 4500 \text{ lbs./hr. of Part.}$$

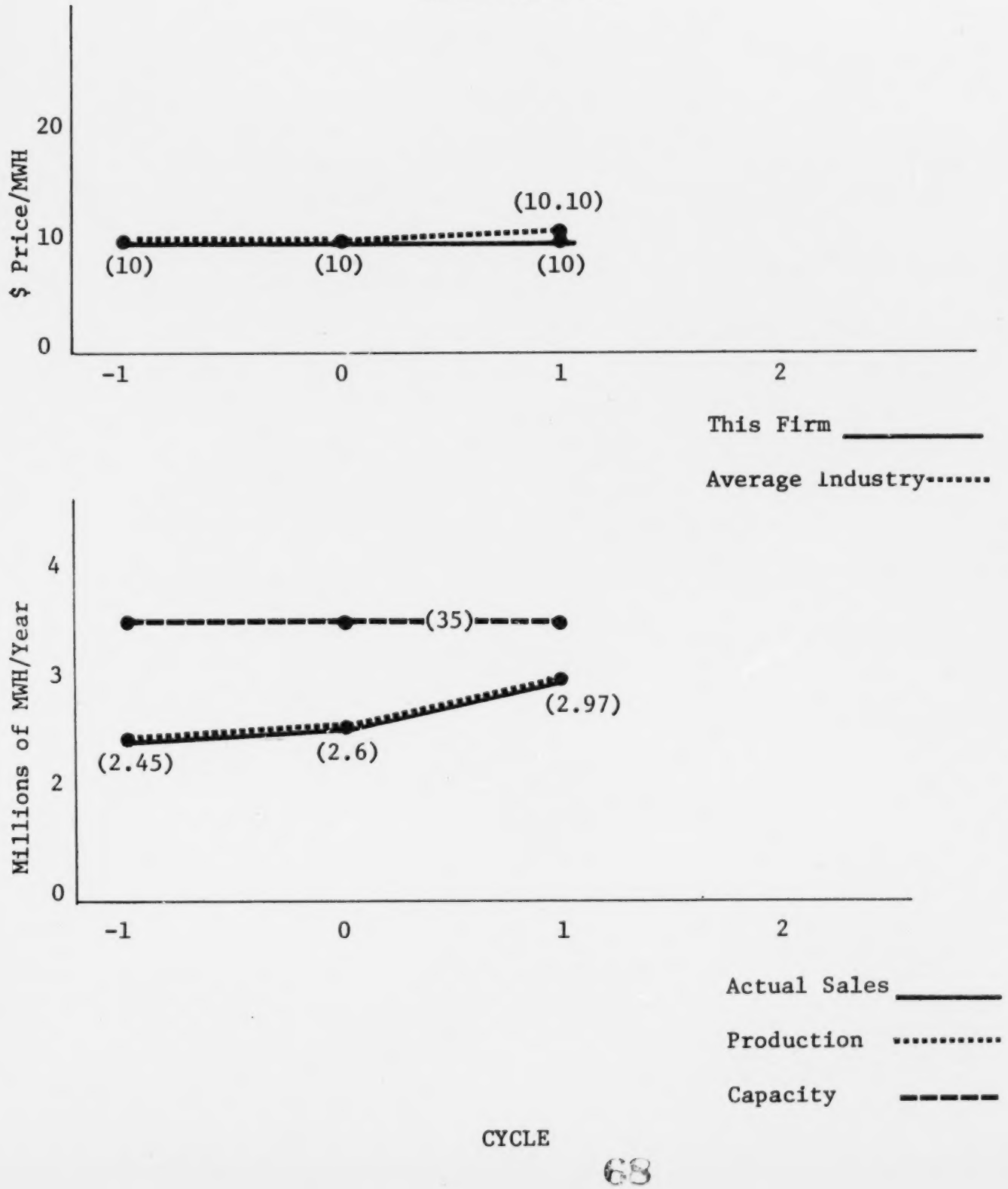
The emission rate for a combustion process can be estimated by multiplying the emission factor for the appropriate fuel type by the fuel/production ratio, and by the production rate (converted to units produced by hour).

For example:

$$\left(\frac{200 \text{ lbs. of Part.}}{\text{ton/low grade coal}}\right) \times \left(\frac{.7 \text{ tons low grade coal}}{\text{ton pulp}}\right) \times \left(\frac{9 \text{ tons pulp}}{\text{hour}}\right) = 1260 \text{ lbs/hr. of Part.}$$

PRODUCTION PRICE RECORD

SHEAR POWER CO.



INDUSTRIALIST NO. 1

Shear Power Company

Production Process (Uncontrolled)

Production Process (Uncontrolled)

INDUSTRY TYPE	PARTICULATES	SO_2	CO	N
1. PULP	14-16 lbs/hr / tons/day	.45-.60 lbs/hr / tons/day		.12-.1 / ton
2. FOUNDRY	7-10 lbs/hr / tons/day	.12-.15 lbs/hr / tons/day	32-35 lbs/hr / tons/day	
3. CEMENT	.8-.9 lbs/hr / bbl/day			
4. COPPER	1.5-2.5 lbs/hr / tons/day	200-220 lbs/hr / tons/day		
5. RENDERING				
6. INCINERATOR	.5-.6 lbs/hr / tons/day	.10-.12 lbs/hr / tons/day		1.10-1 / to
7. DUMP	2.0-2.2 lbs/hr / tons/day	.10-.12 lbs/hr / tons/day		
8. AUTO ASSEMBLY				.05-.0 / ca
9. FORGING PLANT	.002-.003 lbs/hr / tons/day			.006-. / to
10. PRINTING				.0006- / 100

ess (Uncontrolled)

CO	NO_x	HC	SMOKE	ODOR
	.12-.15 lbs/hr tons/day		.003-.006R tons/day	.014-.0175S tons/day
32-35 lbs/hr tons/day			.02-.03R tons/day	.02-.03S tons/day
			.13-.17R tons/day	.18-.22S tons/day
1.10-1.12 lbs/hr tons/day	.10-.12 lbs/hr tons/day		.004-.006R tons/day	.008-.010S tons/day
	12-14 lbs/hr tons/day		.012-.016R tons/day	.016-.020S tons/day
.05-.06 lbs/hr. cars/day	2-3 lbs/hr cars/day			
.006-.007 lbs/hr tons/day				
.0006-.0007 lbs/hr 1000 ft/day	.5-.6 lbs/hr tons/day			

DUSTRY TYPE	PARTICULATES	SO_2 CO	NO_x	HC	SMOKE	ODOR
. FERTILIZER	.18-.22 lbs/hr / tons/day		.001-.002 lbs/hr / tons/day		.02-.03R / tons/day	
. WATER HEATERS			.0002-.0003 lbs/hr / shells/day	.0015-.025 lbs/hr / shells/day		
. ASPHALT PAVING	1.0-1.5 lbs/hr / tons/day		.0010-.0015 lbs/hr / tons/day		.0025-.0035R / tons/day	
. CONCRETE BATCHING	.003-.004 lbs/hr / tons/day					
. GALVANIZING	.04-.05 lbs/hr / tons/day		.008-.0012 lbs/hr / tons/day		.18-.22R / tons/day	
. BRASS MELTING	.9-1.2 lbs/hr / tons/day		.010-.015 lbs/hr / tons/day		.10-.15R / tons/day	
. VARNISH	.0005-.0007 lbs/hr / gallons/day		.0002-.0004 lbs/hr / gallons/day	.0010-.0014 lbs/hr / gallons/day		
. FEED & GRAIN	.9-1.2 lbs/hr / tons/day					
. DRY CLEANING				.007-.008 lbs/hr / lbs/day		
. SOAP & DETERGENT	.55-.65 lbs/hr / tons/day		.005-.006 lbs/hr / tons/day		.008-.011R / tons/day	

EMISSION FACTORS FOR INDUSTRIES IN APEX

Combustion Process (Uncontrolled)

JEL TYPE	PARTICULATES	SO_2	NO_x	SMOKE
. Low Grade Coal	200-220 lbs. / ton coal	180-200 pounds / ton coal	30-40 lbs / ton coal	.012R-.023R / ton coal
. High Grade Coal	80-100 lbs. / ton coal	40-50 pounds / ton coal	20-30 lbs. / ton coal	.010R-.015R / ton coal
. Low Grade Oil	.35- .50 lbs. / bbl oil	11-14 lbs. / bbl oil	5-7 lbs. / bbl oil	.010R-.015R / bbl oil
. High Grade Oil	.12-.18 lbs. / bbl oil	2.5-3.5 lbs. / bbl oil	1.8-2.2 lbs. / bbl oil	
. Natural Gas		.018-.022 lbs. / MCF gas*	.18-.22 lbs. / MCF gas	

*MCF = Thousands of Cubic Feet

INDUSTRIALIST NUMBER 1

MISCELLANEOUS NOTES FROM CYCLE 1
CURRENT PROPERTY HOLDINGS AFTER CYCLE 1
(Developed Residential in Units,
All Other Values are in Acres)

METRC-APEX -- 9/ 9/71 -- INDUSTRIALIST NUMBER 1 --
PRINCIPLES OF AIR POLLUTION CONTROL

A MISCELLANEOUS NOTES FROM CYCLE 1

CURRENT PROPERTY HOLDINGS AFTER CYCL

(DEVELOPED RESIDENTIAL IN UNITS, ALL OTHER VALUES ARE I

		RESIDENTIAL						NON
		SINGLE			MULTIPLE			COMMERCI
AA	STATUS	R-1	R-2	R-3	M-1	M-2	LOCAL	REG
8	DEVELOPED	0	0	0	0	0	0.0	

B

C

● This table shows your status at the end of this cycle including all changes (purchases, rezonings, development, and sales) which occurred during this cycle.

A Additional information found on this page includes:
- Cash transfers to or from other players. These are exchanges of money between players where the reasons for the exchange are unspecified.
- Purchase and/or sale of land
- Rezoning of property granted by the Politicians.

B Zoning categories - see glossary for explanation

C Land ... Type."

D Land, ... exogen... indust... indus...

E Exogen... firm ... outsi...

-- INDUSTRIALIST NUMBER 1 --

CELLANEOUS NOTES FROM CYCLE 1

PROPERTY HOLDINGS AFTER CYCLE 1

IN UNITS, ALL OTHER VALUES ARE IN ACRES)

T I A L //	N O N - R E S I D E N T I A L					
M U L T I P L E //	COMMERCIAL		INDUSTRIAL		OFFICE	AGRICULT
M-1 M-2 //	LOCAL	REGIONAL	LOCAL	EXOG.	E EXOG.	
0 0 /	0.0	0.0	0.0	D 19.00	0.0	0.0

end of this
, rezonings,
d during this

page includes:
ers. These are
where the
cified.

the Politicians.

lanation

C Land use types - See glossary under "Development Type."

D Land, where industrialist's firm is located, is zoned exogenous industrial. To expand a plant, the industrialist must obtain vacant land zoned industrial or have the vacant land rezoned.

E Exogenous refers to an industry or bureaucratic firm that depends primarily upon markets outside the local area.

INDUSTRIALIST NUMBER 1

OUTSTANDING DEBITS (FOR CYCLE 2)

METRO-APEX -- 9/ 9/71 -- INDUSTRIALIST NUM
PRINCIPLES OF AIR POLLUTION CONTROL

OUTSTANDING DEBITS *For cycle 2*

A A. PROPERTY TAXES

	CURRENT	**B** DELINQUENT + 6.00 PER
JURISDICTION 1 --	$ 1170066.	+ $ 0
JURISDICTION 2 --	$ 0.	+ $ 0
JURISDICTION 3 --	$ 0.	+ $ 0
JURISDICTION 4 --	$ 0.	+ $ 0
JURISDICTION 5 --	$ 107394.	+ $ 0

SUBTOTAL -- DUE IN CYCLE 2

B. LOANS

NO.	BALANCE	*Interest* RATE	YRS LEFT	UNDE PE
1	$ 2499996.	4.5	5	$
SUBTOTALS	$ 2499996.			

A *The tax rate is set by the Politician's and can be changed during the course of the game.*

B *If payments made are insufficient to cover the amount due, penality would show here. If delinquency continues a second year, property will be confiscated.*

CURRENT		B DELINQUENT AMT + 6.00 PERCENT			MIN PAYMENT DUE CYCLE 2
1170066.	+ $	0.	=	$	1170066.
0.	+ $	0.	=	C $	0.
0.	+ $	0.	=	$	0.
0.	+ $	0.	=	$	0.
107394.	+ $	0.	=	$	107394.

2 $ 1277460.

Interest RATE	YRS LEFT		UNDERPAYMENT PENALTY		MIN PAYMENT DUE CYCLE 2
4.5	5	$	0.	D $	581647.
				$	581647.

ian's and can
e game.

nt to cover
d show here.
year, property

C Taxes must be paid to avoid penalties for delinquency.

D Loans must be paid to avoid a drop in credit rating.

INDUSTRIALIST NUMBER 1

SHEAR POWER COMPANY
PROFITS AND INCOME TAX STATEMENT

METRC-APEX -- 9/ 9/71
PRINCIPLES OF AIR POLLUTION CONTROL

-- INDUSTRIALIST NUMBER 1 --

SHEAR POWER COMPANY

PROFITS AND INCOME TAX STATEMENT

I. INCOME CALCULATED DURING CYCLE 1

A. 5.00 PERCENT INTEREST ON CASH END OF CYCLE 0
B. PRODUCT SALES
C. CASH TRANSFERS (FROM OTHER PLAYERS)
D. LAND SALES

TOTAL INCOME IN CYCLE 1

II. OPERATING COSTS

A. LABOR
B. MATERIALS
C. FUEL
D. GENERAL ADMINISTRATION
E. INVENTORY CARRYING COSTS
F. POLLUTION CONTROLS OPERATION
A G. PLANT MAINTENANCE
H. CONSULTANTS - POLLUTION EMISSION DATA B
I. CONSULTANTS - CONTROL SYSTEM DATA
J. LOAN PAYMENTS
K. PROPERTY TAXES
L. CASH TRANSFERS (TO OTHER PLAYERS)
G M. CAMPAIGN CONTRIBUTIONS
N. ZONING APPLICATION FEES AND/OR DEMOLITION COSTS

TOTAL OPERATING COSTS IN CYCLE 1

III. PROFITS AND INCOME TAXES

A. GROSS PROFIT (I. - II.)
F B. TAX DEPRECIATION ALLOWANCE
C. TOTAL TAXABLE INCOME (A.- B.)
D. FEDERAL AND STATE INCOME TAXES (55 PERCENT OF C.)
E. NET PROFIT (A.-D.)

A Rate is 8.0% of value of building and equipment

B D
a

-- INDUSTRIALIST NUMBER 1 --

SHEAR POWER COMPANY

RCFITS ANC INCOME TAX STATEMENT

CF CYCLE 0	$ 125000.	
S)	29691024.	
	0.	
	0.	
		$29816016.
	$ 4005000.	
	0.	
	5967894.	C
	3266011.	
	0.	
	0.	
DATA B	5759998.	
	5000.	D
	5000.	
	635000.	
	1274840.	
	0.	
	0.	E
MOLITION COSTS	0.	
		$20918704.
	$ 8897312.	
	- 3599999.	
	$ 5297313.	
S PERCENT OF C.)	- 2913521.	
	$ 5983791.	

C Calcul
level

D Requ
auton

E Rezon
demol
valu

F Depre
Indu
able
Foun
Fact

G Camp
for
issue
rials

ng and equipment

B Data from this survey, when requested, appears on last page.

C Calculated on the basis of the production level set by the Industrialist.

D Requests for consultant surveys carry an automatic cost of $5,000 each.

E Rezoning fee of $100.00 for each rezoning demolition costs are 5% of appraised value.

F Depreciation allowance permits the Industrialist to make some non-taxable income. Maximum allowance found on last page of output ("Cost Factors.")

G Campaign contributions can be made for or against any Politician, bond issue, or special millage. An Industrialist may campaign for himself.

equested, appears

INDUSTRIALIST NUMBER 1

SHEAR POWER COMPANY
CASH IN - CASH OUT STATEMENT

METRO-APEX -- 9/ 9/71
PRINCIPLES OF AIR POLLUTION CONTROL

-- INDUSTRIALIST NUMBER 1 --

SHEAR POWER COMPANY

CASH IN - CASH OUT STATEMENT

IV. CASH IN

A. CASH CARRYOVER FROM CYCLE 0 $ 2
B. TOTAL CYCLE INCOME 29
C. NEW LOANS REQUESTED (AND APPROVED)

TOTAL CASH IN

V. CASH OUT

A. TOTAL CYCLE OPERATING COSTS $20
B. FEDERAL AND STATE INCOME TAXES 2
C. CAPITAL EXPENDITURES

B 1. PRODUCTION EQUIPMENT EXPANSION 0.
2. BUILDING EXPANSION 0.
3. LAND PURCHASES 0.
4. POLLUTION CONTROL EQUIPMENT C 0.

TOTAL CAPITAL EXPENDITURES $
D D. DIVIDENDS PAID 5

TOTAL CASH OUT

VI. CASH AVAILABLE FOR CYCLE 2 (IV - V.)

VII. FINANCIAL STANDING -- OVERALL

A. TOTAL NET WORTH
(CASH + PHYSICAL PLANT + MARKET VALUE OF INVENTORY CARRYOVER - OUTSTAN
B. NET WORTH AT END OF CYCLE 0
C. PERCENT CHANGE FROM CYCLE 0
D. MAXIMUM NEW LOAN POSSIBLE AT YOUR CREDIT RATING OF A-1

RIALIST NUMBER 1 --

AR POWER COMPANY

CASH CUT STATEMENT

	$ 2500000.	
	29816016.	
	0.	A
		$32316016.
	$20918704.	
	2913521.	
0.		
0.		
0.		
0.		
	$ 0.	
	5900000.	
		$29732224.
		$ 2583792.
		$72843792.
VENTORY CARRYOVER - OUTSTANDING LOANS)		$72124992.
		1.00
TING OF A-1		$20103120.

A Loan requested as it does not down to near

B Minimum incr these items fa tion" in the D

C Investment in

D Decision's as to the hand of th (Game Operator) be offered.

A Loan requested will be granted as long as it does not exceed line VII D, rounded down to nearest $10,000, e.g. $20,100,000.

B Minimum incremental expenditures for these items found in the "Firm Description" in the Player's manual.

C Investment in new equipment only.

D Decisions as to dividends paid rests in the hand of the Board of directors (Game Operator). Recommendations may be offered.

INDUSTRIALIST NUMBER 1

SHEAR POWER COMPANY
PRODUCTION INFORMATION

METRC-APEX -- 9/ 9/71
PRINCIPLES OF AIR POLLUTION CONTROL

-- INDUSTRIALIST NUMBER 1 --

SHEAR POWER COMPANY
PRODUCTION INFORMATION

	CYCLE 1	CYCLE 0
A MAXIMUM CAPACITY	3500000.MWHR	3500000.MWHR
UNITS PRODUCED	2969103.MWHR	2600000.MWHR
PERCENT OF CAPACITY USED	84 PCT	74 PCT
INVENTORY	0.MWHR	0.MWHR
INVENTORY UNITS SOLD	0.MWHR	0.MWHR
NUMBER OF EMPLOYEES	534	468
B INVENTORY CARRYOVER TO CYCLE 2	0.MWHR	
MAXIMUM CAPACITY FOR CYCLE 2	3499999.MWHR C	

SALES INFORMATION

AVERAGE INDUSTRY WIDE PRICE	$ 10.10 PER MWH	$ 10.00 PER M
THIS FIRM'S PRICE	$ 10.00 PER MWH	$ 10.00 PER M
ESTIMATED SALES	2800000.MWHR	2600000.MWHR
ACTUAL SALES	2969103.MWHR	2600000.MWHR
D ESTIMATED SALES IN DOLLARS	$ 28000000.	$ 26000000.
D ACTUAL SALES IN DOLLARS	$ 29691024.	$ 26000000.

RATE OF PROFIT (NET PROFIT/TOTAL VALUE PLANT AND EQUIPMENT 8.22 P

INVENTORY OF PHYSICAL FACILITI
AT PRODUCTION LOCATION

LAND	TOTAL LAND AREA (ACRES) =	19.00
	VACANT LAND AREA (ACRES) =	0.0
	VACANT LAND WILL ACCOMODATE	0.0 SQ.FT. OF AD
BUILDING	BUILDING AREA (SQFT) =	550000.00
EQUIPMENT	GENERAL PRODUCTION EQUIPMENT	
	POLLUTION CONTROL EQUIPMENT	
	TOTAL VALUE O	

Note: If there are air pollution control devices, this table should show the processes which are controlled, the control system, whether or not the system is operated, and the value of the equipment.

DUSTRIALIST NUMBER 1 --

HEAR POWER COMPANY
CTION INFORMATION

	CYCLE 0	CYCLE -1
	3500000.MWHR	3500000.MWHR
	2600000.MWHR	2450000.MWHR
	74 PCT	70 PCT
	0.MWHR	0.MWHR
	0.MWHR	0.MWHR
	468	441

C

LES INFORMATION

MWH	$ 10.00 PER MWH	$ 10.00 PER MWH
MWH	$ 10.00 PER MWH	$ 10.00 PER MWH
	2600000.MWHR	2450000.MWHR
	2600000.MWHR	2245000.MWHR
	$ 26000000.	$ 24500000.
	$ 26000000.	$ 24500000.

QUIPMENT 8.22 PERCENT

Y OF PHYSICAL FACILITIES
T PRODUCTION LOCATION

=	19.00	LAND VALUE = $	760000.
=	0.0		
TE	0.0 SQ.FT. OF ADDITIONAL BUILDING		
=	550000.00	BUILDING VALUE = $	17000000. E
RAL PRODUCTION EQUIPMENT VALUE = $			55000000.
LUTION CONTROL EQUIPMENT VALUE = $			0.
	TOTAL EQUIPMENT VALUE = $		55000000. E
	TOTAL VALUE OF PHYSICAL FACILITIES = $		72760000.

A Set by amou
available at

B Inventory car
production a

C Maximum
unless depr
maintenance
will increas
tures. There is
tures and au

D Actual sales
economy and
firm's price

E 8.0% of the
value is re

A Set by amount of plant and equipment available at beginning of the cycle.

B Inventory carryover calculated by summing production and inventory, minus table sales.

C Maximum production capacity will decrease unless depreciation is balanced by plant maintenance expenditures. Maximum capacity will increase with increased capital expenditures. There is a one cycle lag between expenditures and availability of new capacity.

D Actual sales are determined by the national economy and by the difference between firm's price and the industry wide price.

.E

E 8.0% of the building value and equipment value is required for maintenance costs.

.E

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INDUSTRIALIST NUMBER 1

SHEAR POWER COMPANY
COST FACTORS FOR CYCLE 2

METRC-APEX -- 9/ 9/71
PRINCIPLES OF AIR POLLUTION CONTROL

-- INDUSTRIALIST NUMBER

SHEAR POWER COMPANY

COST FACTORS FOR CYCL

A. AVERAGE ANNUAL WAGE PER EMPLOYEE
B. MATERIAL COSTS PER PRODUCT UNIT
C. AVAILABLE FUELS AND COST PER PRODUCT UNIT
   1. LOW GRADE COAL
   2. HIGH GRADE COAL
   3. LOW GRADE OIL
   4. HIGH GRADE OIL
   5. NATURAL GAS
D. GENERAL ADMINISTRATION COSTS PER PRODUCT UN
E. INVENTORY CARRYING COSTS PER PRODUCT UNIT
F. FED. AND STATE INCOME TAX RATE
   (PERCENT OF TOTAL TAXABLE INCOME)
G. TAX DEPRECIATION ALLOWANCE RATE
   (PERCENT OF VALUE OF BUILDINGS AND EQUIPMEN
H. MAX. TAX DEPRECIATION ALLOWANCE FOR CYCLE
   (INCLUDING AMOUNTS NOT CLAIMED IN PRIOR CY
I. PLANT MAINTENANCE RATE
   (PERCENT OF VALUE OF BUILDINGS AND EQUIPMEN
J. MAINTENANCE EXPENDITURE REQUIRED IN CYCLE
K. CONSULTANT FEE - POLLUTION EMISSION DATA
L. CONSULTANT FEE - CONTROL SYSTEMS DATA
M. ZONING APPLICATION FEE

N. FUEL IN USE IN CYCLE 1

A C *These costs will be applied to the number of units produced in cycle 2 to yield operating costs. They are implied when a production level is set.*

B *All the fuels options are listed here see N for type of fuel utilized in this cycle.*

D *Per the ... costs*

E *If ... the ... to ... cycl...*

SHEAR POWER COMPANY

COST FACTORS FOR CYCLE 2

WAGE PER EMPLOYEE	$	7574.99
PER PRODUCT UNIT	$	0.0
ANC COST PER PRODUCT UNIT		
CCAL	$	2.19
COAL	$	2.55
OIL	$	2.03
CIL	$	2.91
S	$	4.74
TRATICN COSTS PER PRODUCT UNIT	$	1.10
ING CCSTS PER PRCDUCT UNIT D	$	0.0
INCOME TAX RATE		55 PERCENT
AL TAXABLE INCCME)		
N ALLOWANCE RATE		5 PERCENT
UE OF BUILDINGS AND EQUIPMENT)		
IATICN ALLOWANCE FCR CYCLE 2	$	3599999.
NTS NOT CLAIMED IN PRICR CYCLES)		
CE RATE		8 PERCENT
UE CF BUILDINGS AND EQUIPMENT)		
ENDITURE REQUIRED IN CYCLE 2	$	5759998.
- PCLLUTICN EMISSION CATA		$5000
- CONTROL SYSTEMS CATA		$5000
ION FEE		$ 100

YCLE 1 TYPE 3 (SEE CODE UNDER C. ABOVE)

...he number
... yield
...uden a

...here
...n this

D There will be no inventory carryover for the Shear Power Company. Plus no carrying costs will appear here.

E If this is not all claimed in cycle 2, the unclaimed portion will be added to the amount which may be claimed next cycle.

● 29 APEX ANALYSIS AREAS

TOWNSHIP 1

Areas 23, 24, 25, 26, 27 and 28

TOWNSHIP 2

Areas 14, 15, 16, 20, 21, 22 and 29

SUBURB

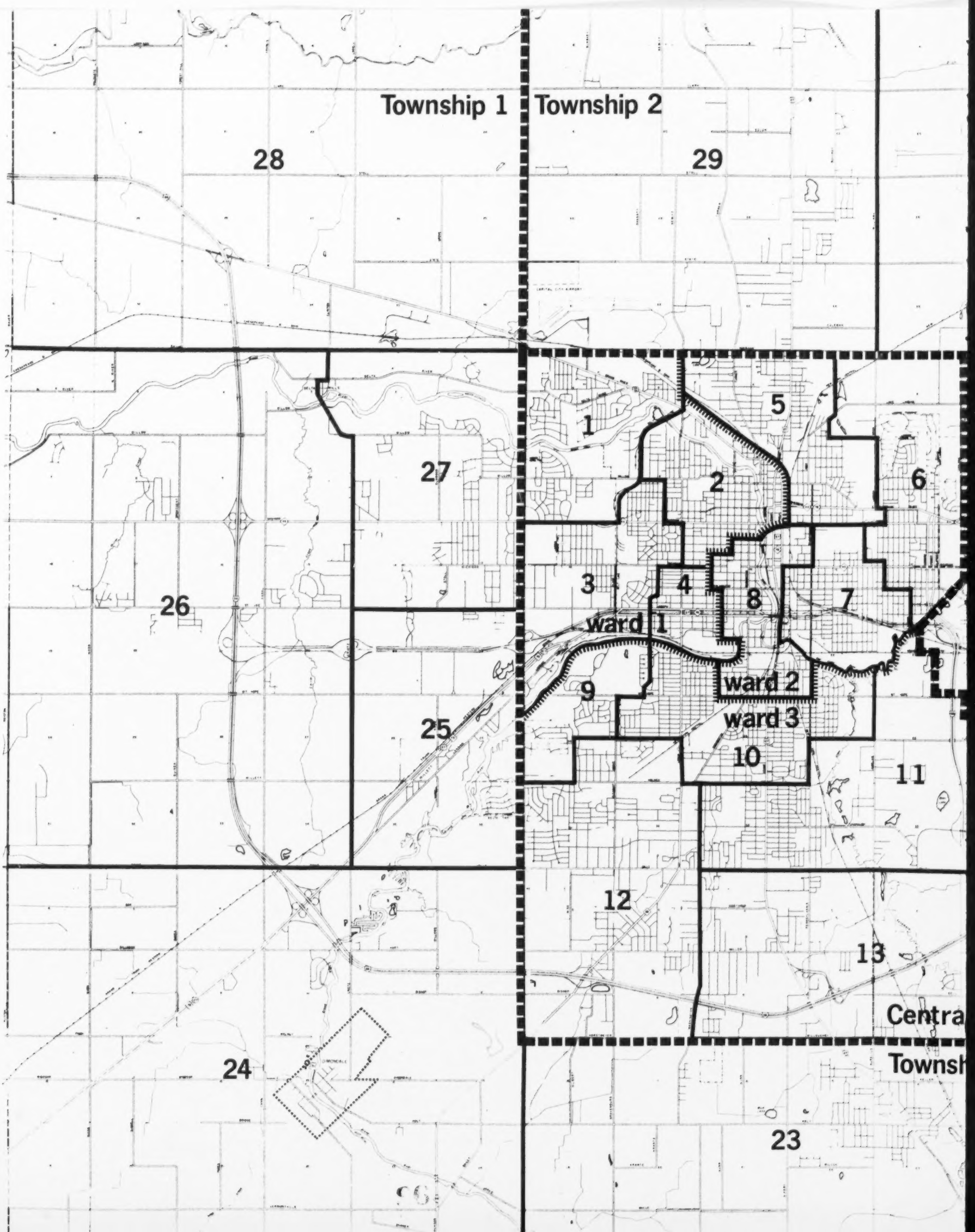
Areas 17, 18 and 19

CENTRAL CITY

Ward One: Areas 1, 2, 3, and 4

Ward Two: Areas 5, 6, 7 and 8

Ward Three: Areas 9, 10, 11, 12 and 13


Township 1
Township 2
28
29
27
26
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24
23
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ward 1
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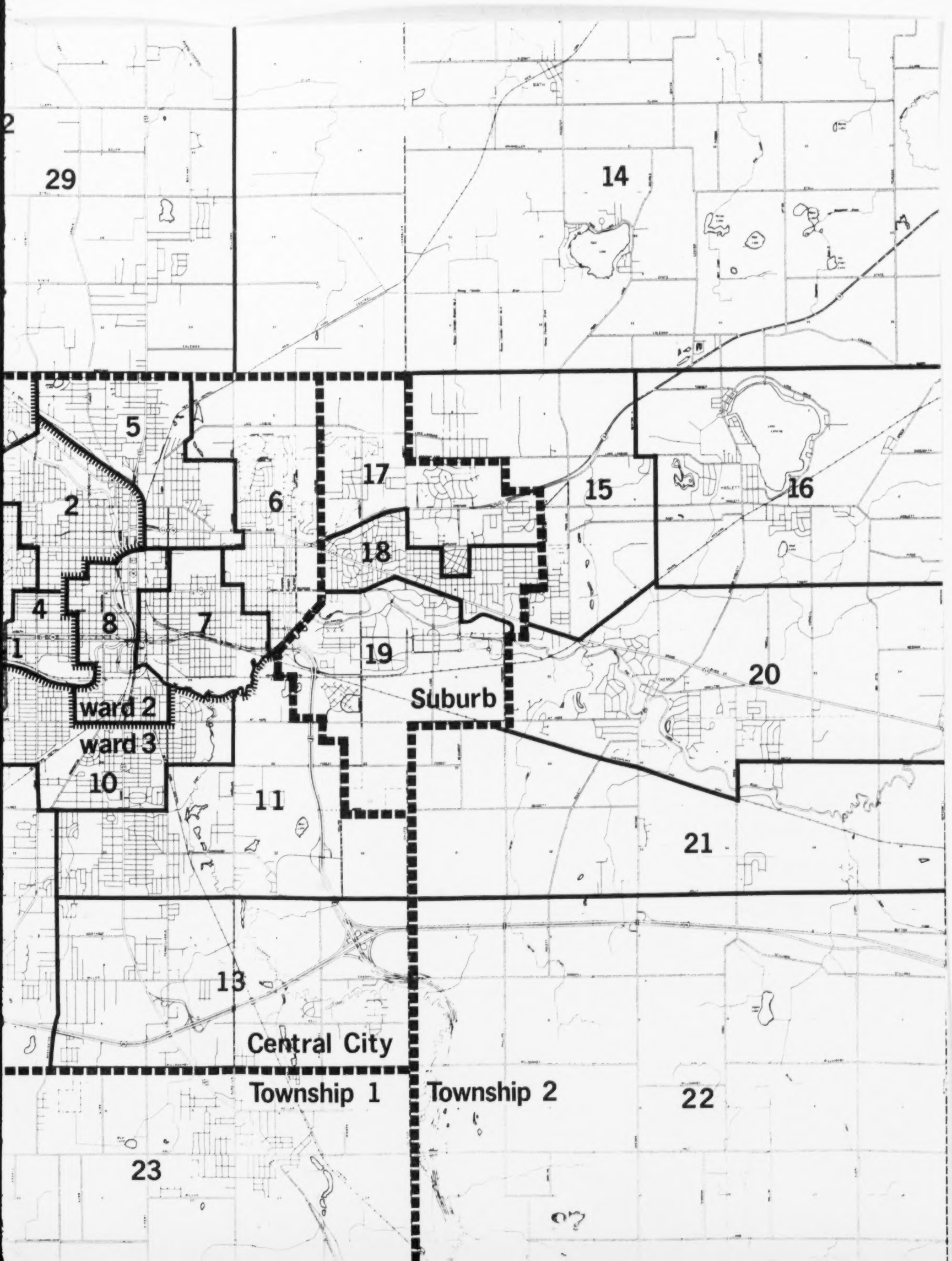
29
14
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8
7
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19
20
ward 2
Suburb
ward 3
10
11
21
13
Central City
Township 1
Township 2
22
23